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APPLICATIONS FOR SERVICE.

In a great many central-station companies an unnecessary amount of formality is required before a new customer is provided with service. Sewing up the relations of the utility company with the public in red tape is often a source of irritation to the new customer and, in addition, the signing of a long contract which contains a bewildering amount of legal verbiage is distasteful to the average citizen. It is not difficult to greatly simplify the operation of being initiated into the convenience and comfort of using electric service, and a number of central stations have given consideration to the best means of simplifying this operation.

A study of this subject comes down at once to an analysis of the necessary requirements for safeguarding the interests of the utility company and preventing, as far as possible, any imposition by unscrupulous consumers. It should be realized in the first place, however, that the average citizen is honest and quite ready to live up to his obligations. A formal contract is not only unnecessary in most cases, but is of little or no advantage, especially with reference to the usual residence consumer. A person who accepts service and consumes electrical energy becomes liable for payment for the same regardless of whether any definite contract has been signed. In most of the states public service commissions have been created and rates have been filed with them covering each class of consumer, so that there is no question as to what is the legal rate of payment for service. In a few communities where rates are still a matter of special contract with each customer it remains, of course, necessary to sign a contract specifying a definite rate for service.

Since in general no written contract is necessary, the principal requirement is to place responsibility for payment for service. This involves the signing of an application for a service connection. The wording of such application should be brief and the formalities should be as simple as possible. Upon a telephone or mail request the application should be supplied by messenger or by mail, and the irksome requirement which some companies now make of having the applicant come to the company's office might well be abandoned in the interest of good feeling. In large cities a written application seems highly desirable, both in order to fix responsibility and for accuracy in the name and address of the applicant. In

some small communities even such written application may be superfluous. This has been demonstrated by certain companies which are prepared to make service connection upon the basis of a telephone request or other verbal communication.

Attention to small matters of this kind is one of those things which often has a marked effect in producing cordial relations between a utility company and the public. Slight sources of irritation often create bad feeling and it is well to remove causes of this kind, in line with the general policy of pleasing the public which has been adopted by most of the progressive companies. This is but one line of approach to the ultimate object, but there are many others in small matters of detail which will readily suggest themselves to the central-station manager.

ENGINEERING IMPROVEMENTS AND PUBLICITY.

One of the most interesting things about the transcontinental telephone service now available in the United States on the Bell system is the extent to which this famous achievement has been turned to account by the publicity departments of the telephone companies. Without being able to support the statement by figures, we venture to guess that the advertising value of the ocean-to-ocean line is quite as great so far as the actual revenue derived from it. Through the co-operation of the telephone organization a good many meetings and dinners of commercial associations on the Atlantic slope have been enlivened by special "set-ups" connecting the members and guests with their brethren on the Pacific coast, and the thrill of listening for the first time to words and music thus transmitted across the land is not one easily to be forgotten. Thousands of visitors to the Panama-Pacific International Exposition have had the same experience.

One of the most notable of these exhibition transmissions was recently carried through in connection with a meeting of some 5,000 employees of the New England Telephone & Telegraph Company at Boston, Mass., and a similar meeting at San Francisco of the employees of the Pacific company. Besides the usual official greetings between executives, the New Englanders sang "America" for the benefit of their compeers on the Coast, who returned the compliment with the "Star Spangled Banner" a few moments later. The enthusiasm "uncorked" at such occasions has a legitimate place in the celebration of this great engineering triumph, and whether turned to account in stimulating company loyalty or in demonstrating to groups of representative business men the capabilities of modern electricity in an unusually inspiring field, it is well worth developing from the standpoint of public relations.

On a much smaller scale, the central-station man asks himself: "Why shouldn't our company capitalize popular interest in its progress?" Even if the achievements of the local management in safely and efficiently providing an important extension of plant lack boldness, it should not be forgotten that there are many people even in small cities or towns who like to know and see the latest developments in generating equipment, substations, etc., and when these are accomplished, what is easier than to invite the local board of trade to visit the plant under skilled guidance, to prepare a simple illustrated "story" upon the improvements for the local press, and to set forth for the popular interest the points wherein such an installation excels previous equipment or neighboring plants? It often occurs that engineering improvements of the very first order are installed initially in some little steam or hydroelectric plant remote from the great centers of industry, and that expert engineers from all points of the compass make pilgrimages to the plant to see the apparatus in operation. Now the local public may not be capable of realizing the technical fine points of such equipment, but it is always possible for the local management to give out in a fairly simple form some of the reasons why the improved equipment is attracting attention or is worth a visit from the electrically and mechanically minded.

Local pride is a very real force in America, and whenever an improvement of engineering significance is accomplished in a community of small or moderate size, a genuine opportunity comes to the front to add to the company's stock of public good-will.

TRANSCONTINENTAL RADIOTELEPHONY.

The year 1915 is notable for two great achievements in telephony. It has seen a commercial line between New York City on the Atlantic seaboard and San Francisco on the Pacific coast opened for regular business and devoted to daily demonstrations at the Panama-Pacific International Exposition. It has also witnessed the successful achievement of telephony across the American continent with wireless apparatus. As described upon another page, telephonic communication has been carried on between the radio station on the bank of the Potomac and the navy yard on San Francisco Bay. The message has even been received at a third station at Honolulu, thus setting a much longer record for the transmission of radiotelephonic messages. This achievement has been accomplished by the engineers of the Navy and the Bell telephone system.

An announcement of almost equal interest which has been made at the same time is that the radiotelephonic message need not originate at the sending station, but may be transmitted to it by wire. This possibility will greatly enhance the usefulness of radiotelephony and points to the likelihood of its becoming a commercial reality within a reasonable time. Its accomplishment probably hinges upon the use of the telephone repeater, or amplifier, which was the dream of inventors for so many years, and whose eventual realization was so large a factor in the achievement of transcontinental telephony by wire.

PUBLIC POLICY IN REGARD TO THE BARE CONCENTRIC SYSTEM.

The introduction of the bare concentric wiring system of installation in existing houses is arousing considerable interest in various parts of the country. While we recognize the advantages of a more economical means of providing service, thus hastening the day when electric lighting shall be universal, there are some practical considerations which we feel should be taken into account before entering upon a systematic propaganda for the concentric method.

Granting that installations of bare wire would be entirely free from liability of danger to property or person, a point we are not ready to concede, there remain some questions of public policy which should be weighed by a public service company which supplies any community.

First, the public's attitude as regards safety. When the proposition is put to the average layman, immediately the objection arises that a bare wire carrying current is in itself a source of danger. This is a notion which the central station itself has not discouraged, but rather cultivated. In "Safety First" campaigns the idea has been steadily advanced that any wire in the public streets was liable to be a menace, when out of its proper relation, and best left to the rubber-gloves men. Whenever a fallen wire was encountered, the public was taught to let it alone; even innocent-looking guy wires might be charged with high voltage by chance contact with transmission lines.

Now the public cannot be expected to discriminate between harmless low-tension circuits and those contact with which is deadly. Every central-station man will acknowledge that the public's wholesome fear of "live wires" saves thousands of dollars of damage claims, yearly.

The point, in connection with the concentric plan, is that if people, and especially children, become habituated to the view that bare wires which light their house lamps are harmless, they will come to hold the same opinion of wires on the street, and nonchalance and bravado will take their toll of victims, soon or late.

A second aspect of the proposition is the division of homes into two separate classes for purposes of lighting services. The advocates of the concentric system base their arguments mainly on the lessened cost, which places the concentric-wire service within reach of the smaller householder and even the least well-to-do, the standard code system being recognized as best suited to larger houses, as well as business blocks.

This division is repugnant to popular sensibilities. Every American wishes to have as good and as complete an equipment as his neighbor enjoys. The argument that the new plan is precisely as safe and efficient fails to satisfy the layman. Even where the lighting company does not wire houses, the public is inclined to look upon the installation indoors and upon the street as parts of the same system, and this view is strengthened where lamps are freely supplied and renewed by the company.

Hence it follows that a householder or a tenant would likely regard a basic difference in the character of lighting equipment as discrimination. Furthermore, he argues, if one person's wiring is supplied at a lower cost than another's, why should not the actual illumination of his home be obtained at a differential rate? The plea might go to such lengths as to ask whether electricity delivered to one house through concentric cable should not cost but one-half as much as electricity supplied through two parallel wires. No less absurd an argument has at times turned the scale in favor of gas lighting.

The Stannos concentric system, being an importation from Europe, might suggest to some customers that lighting rates ought likewise to conform with those abroad: in England, about 75 per cent of those here, in Germany, perhaps 50 per cent, and in some parts of Italy the modest sum of one lire—20 cents—an outlet per year. That economy in house wiring is practicable leads logically to the query whether economies in station and line equipment, and in operation, are not forthcoming. Thus the whole situation is complicated and beclouded.

If the savings of the proposed system were large, it might be worth while to combat and overcome all opposing fancies. But it is conceded by those who have put the matter to the test that the sole advantage is derived from economy of materials. This is a smaller factor here than abroad, labor being more expensive and materials a little cheaper than in Europe. Contractors reckon the labor cost in wiring existing houses at from 50 to 60 per cent of the contract. In a recent house-wiring campaign conducted by an eastern central station the average contract amounted to about $80. Eliminating overhead and labor leaves not more than 40 per cent, or about $32, for stock used in a house. Assuming a saving of 25 or 33 per cent, the difference in cost would be about $10, or a matter of $1 to $1.25 a year for depreciation and interest on the difference in investment. Surely not a large item to a householder who can afford an outlay of $70 to $80 to procure good lighting! And on smaller installations the saving is less.

These suggestions are thrown out for consideration by those interested in the concentric system. They are by no means conclusive arguments, but are worthy of consideration in discussing the subject, as they bring out points of view that are commonly ignored by enthusiastic advocates of a cheaper system of wiring. Every possible viewpoint of the situation should be considered before final action is taken, and the trial installations already made in Chicago, Boston and other cities will aid in achieving this result.

The Jovian Convention.

All signs point to a banner meeting in connection with the thirteenth annual Jovian convention, which will be held at the Hotel Sherman, Chicago, Ill., October 13, 14 and 15, 1915. The Reigning Jupiter, Homer E. Niesz, as chairman of the General Convention Committee, has spurred on his active lieutenants in Chicago and the preparations which have been made guarantee that with regard to both the serious business meetings of the convention and entertainment nothing will be left undone to make the visit of attending Jovians one of great profit and pleasure.

The program has been arranged so that from Monday morning until Friday evening every moment will be engaged. The speakers have been drawn from the leaders in great activities both within and without the electrical industry. The following topics will be discussed: "Extending the Utilization of Electrical Energy," by E. W. Lloyd, president of the National Electric Light Association; "A Clearing House for Electrical Associations"; "The Relation of the Jobber to the Electrical Industry"; "Safety in Electrical Installations," by Ernest McCleary; "The Relation of Technical and Non-Technical Men In the Electrical Field"; "The Progress of the Electrical Industry," by F. M. Feiker; "Contingent Benefits from Promotion of Electric Vehicle Sales," by John F. Gilchrist, president of the Electric Vehicle Association of America; "The Making of a Man"; "Electrical Properity Week"; "The Public Utility as a Factor In the Development of a City," by Henry M. Byllesby; "Merchandising Methods"; "Thrift Among Employees of Electrical Companies."

Homer E. Niesz,
Reigning Jupiter of the Jovian Order.

The degree team competition will bring out all the fine points of the presentation of the ritual, and the elaborate arrangements made for staging the competiton and also the initiation in connection with the big rejuvenation on Thursday evening, will afford the Jovians an unusual opportunity for viewing in all of its austerity the story of the fundamentals of Jovianism.

While primarily the annual meeting of the Jovian Order is for the purpose of preparing for the benefit of the entire membership a recapitulation of the work of administration and the election of officers for another year, it also affords quite properly a chance for the active men of the industry to exchange experiences and to listen to the presentation of important addresses for improving both personal and business efficiency.

In addition to this serious purpose, the Jovian is a jovial spirit, and the entertainment features that have been provided recognize the splendid spirit of good-fellowship which permeates the Order. So that all may enjoy every feature of the entertainment the wise decision has been made to preserve to as great a degree as possible a spirit of informality in connection with every feature.

So that the visiting ladies may enjoy to the full the hospitality of Chicago Jovians, arrangements have been completed and a host of Chicago ladies will be available to escort the visiting ladies to various points of interest. The shopping tours will be personally conducted and the luncheons will be real homey affairs. The program for the ladies is so arranged that they will not be segregated and held to an inflexible schedule, but may elect to attend the sessions at will or to participate in other activities.

Under the direction of Oscar Dane, of St. Louis, what is expected to be the most brilliant and altogether remarkable program ever witnessed as a private entertainment, will be presented on Friday evening as the culminating event of the convention. The entire first and second floors of the Hotel Sherman will be reserved for the Jovians, and over 200 costumed performers, assisted by eight or ten orchestras, will provide the entertainment. The attending Jovians will progress from one scene to another, and it is conceded that there will be so much to be seen that it is hardly possible that all that is available will be witnessed. There will be music and singing and dancing and vaudeville galore. During the progress of the entertainment a supper will be served and after the entertainment is concluded the dancing will continue until very weariness sounds the signal for lights out.

Much interest is being manifested in the contests for Congress and other elective offices. Large delegations are promised from St. Louis, New York, Cincinnati, Dayton, Memphis, Chattanooga and other outlying points. Over 500 members of a big committee of promotion and publicity are exerting every effort to spread information respecting the development of the program and a committee of 50 transportation experts is completing arrangements for the provision of special cars and the facilitating of travel to Chicago from outlying points.

The Avo Club to Celebrate Edison Day.

The Avo Club of the School of Applied Industries, Carnegie Institute of Technology, Pittsburgh, Pa., is planning a program for the celebration of Edison Day. The club is composed of students in the electrical courses in the above school, its object being to promote interest in electrical work and to bring the fellows together socially. The custom of celebrating Edison Day in the school was inaugurated last year by the Electrical Equipment Department, and as it was very successful, the club hopes to make it even more so this year. Papers will be read on appropriate subjects by different members of the club and liberal use will be made of stereopticon views and possibly of motion pictures. Models of Edison's early inventions as well as of some modern ones will probably be shown.

Although no official statement has been made of the fact, there is every probability that the newly constructed branch of the Canadian Northern Railway to Lake Winnipeg will in the near future be electrified, as well as the terminals at Winnipeg, Man., the company installing the current which the street-railway company is developing on Winnipeg River.

Industrial Power Series—Article No. 141.

ELECTRICITY FOR MUNICIPAL PUMPING.

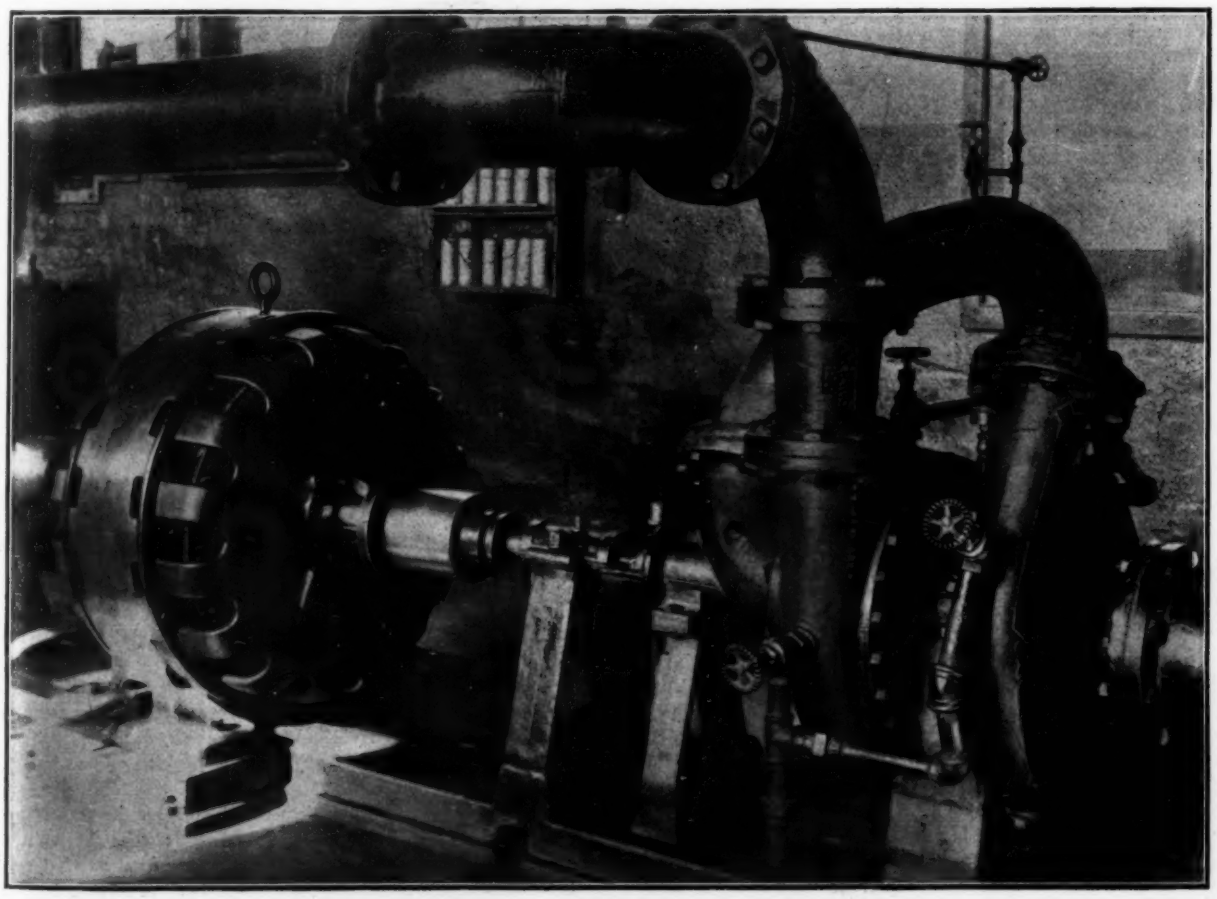
Water-works pumping represents one of the most profitable fields for new business among central-station companies, principally because of its off-peak characteristics. This article discusses pump and motor characteristics and presents data on tests made at three typical installations.

Water-works pumping represents one of the most profitable fields for new business among central-station companies, although it is seldom given the consideration it deserves. Perhaps the difficulty in overcoming adverse political situations, or the belief on the part of the municipality that steam pumps are more reliable, has accounted to a considerable extent for the seeming lack of activity in this direction. It is true, however, that because of the off-peak characteristics of the pumping load, a rate for energy can be offered the municipality that will effect considerable savings over steam operation and in this age of centralization, the reliability of central-station service cannot be questioned.

A municipality, no matter how friendly toward the local utilities, is one of the most difficult prospects to sell to, and the manager or power agent desiring to introduce central-station service for water pumping must be well fortified with sound arguments and have available results of operation in other communities.

In a general way there are two kinds of water-works systems in use in this country, one a direct system where no reservoir capacity is provided, the rate of pumping varying directly as the demand for water, and the reservoir system, where a reservoir is provided so that water may be supplied after the pumps are shut down. Of the two systems, the most attractive and the easiest to get on a profitable basis is, of course, the reservoir system. With such a system the pumping can be very largely done at such times as best suits the load conditions of the central station and so can be made practically off-peak business. For such business the central station can offer very low rates and still make a profit.

In a direct system, of course, the reservoir feature is lacking and for this reason this pumping business does not offer so great an attraction for the central station. It must be remembered, however, that the greatest demands for water are during the months from April to October, when the demand for electric energy is least; and the demands for water are least from October to April, when the demand for energy is greatest. There is thus an annual diversity-factor offered, even in direct systems, which is most attractive. Practically all new systems being installed have the reservoir feature, so that there is an opportunity for the



Two-Stage Centrifugal Pump Driven by 100-Horsepower Motor.

central stations of the country to secure most of this business as off-peak business. For the direct systems that are already installed, probably the best method of securing this business is by advocating a combined station, the old steam equipment to operate during peak months, etc., and motor-driven pumps to carry the summer pumping peaks. This arrangement gives the central station a diversity that should be most acceptable.

In many cities the suburbs are built upon hills that are often considerably above the city proper. In many cases the water pressure which is suitable for the main portion of the city is entirely too low for the suburbs, so that the pressure of the water furnished the suburbs has to be boosted. Sometimes special high-pressure mains are provided for such suburbs, but a simpler way is by installing local motor-driven boosting stations in the suburbs.

Pump and Motor Characteristics.

Two types of pumps may be considered for driving by electric motors, the plunger type in its various forms and the centrifugal type in several forms differing only slightly. Usually the plunger type considered would be triplex and either single or double acting.

The plunger type has the advantage of being a little more efficient than the centrifugal, but it is essentially a low-speed machine, limited to thirty revolutions per minute or thereabouts. It therefore requires speed reductions, as by gearing, for connection to driving motor, thus increasing cost and adding complexity.

The centrifugal pump, on the other hand, is suitable for direct connection to motors operating at their normally high speeds, up to say 1,500 revolutions per minute. Such pumping units are low in first cost, compact and easily operated. Further, centrifugal pumps are suited to direct-pressure service, that is, they may be used to supply water direct to city mains without requiring a standpipe, which is not true of the plunger type, these requiring by-pass and relief valves as they are naturally constant-quantity pumps when driven by a constant-speed motor.

There have been many improvements in centrifugal pumps within the last few years, and standardized product can be obtained from the best manufacturers, with pump efficiencies of 60 to 70 per cent and over, even in small sizes, and with characteristics suited to direct-pressure service. Motor and pump should be mutually adapted, as there is possibility of danger of overloading the motor when pumping against too low a head.

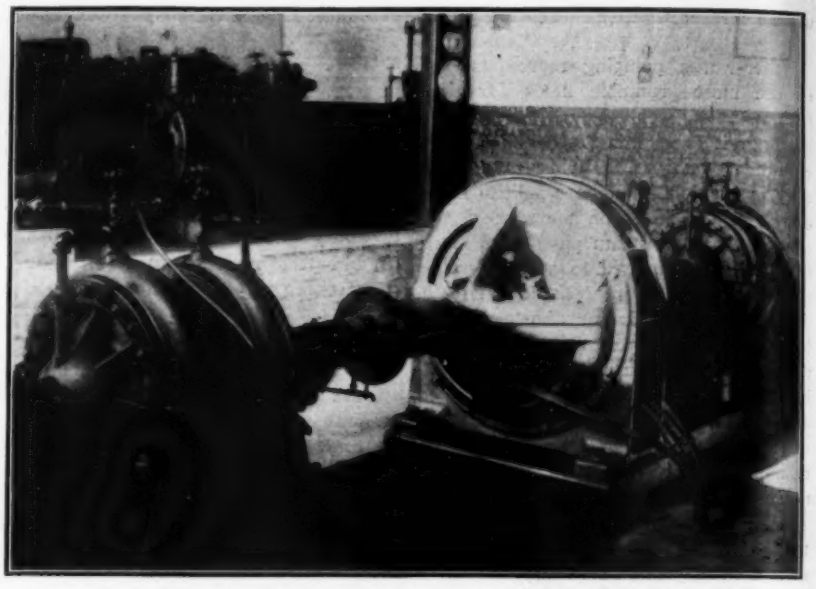
Both types give reliable and satisfactory service under conditions to which they are essentially adaptable; they appear to be remarkably free from troubles, and expense for maintenance and repair is low.

The opportunity for measuring power electrically is of advantage in analyzing costs and separating plant wastes.

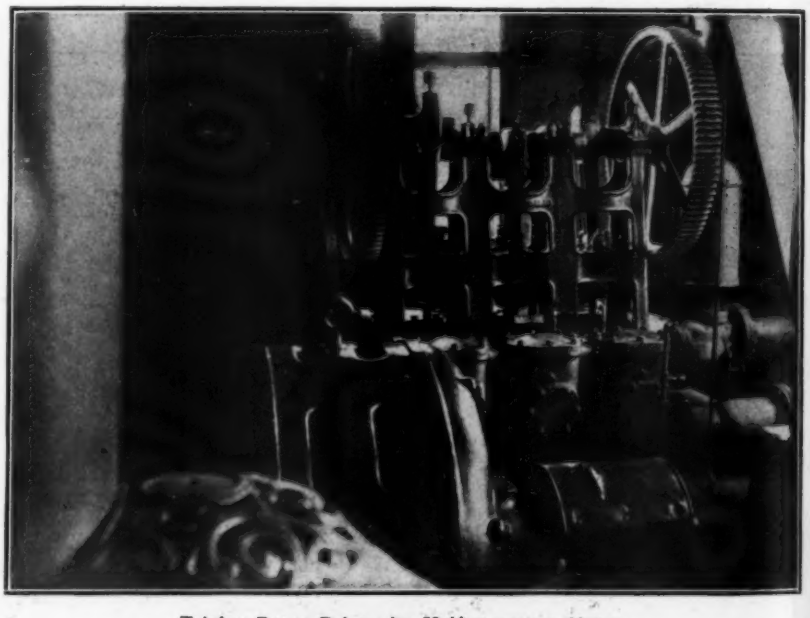
In the large city pumping stations where the efficient or high-duty pumping units have held the field for years, it is possible that only some exceptional local condition will give the preference to electrically driven pumps. This is especially true since the advent of the steam-turbine-driven centrifugal pumps.

However, in the smaller plants where the inefficient duplex direct-acting steam pumps are in use, considerable improvement in economy can be secured by changing to electric pumping.

For a specific example let us assume that the water supply necessary is 300 gallons per minute on the average, at a pressure of 60 pounds per square inch. The water horsepower will average about 10, and with ordinary direct-acting steam pumps the steam consumption will probably approach 150 pounds of steam per delivered horsepower-hour, whereas an electrically driven centrifugal pump, with efficiency as low as 60 per cent, would require a motor input of 16 kilowatts.



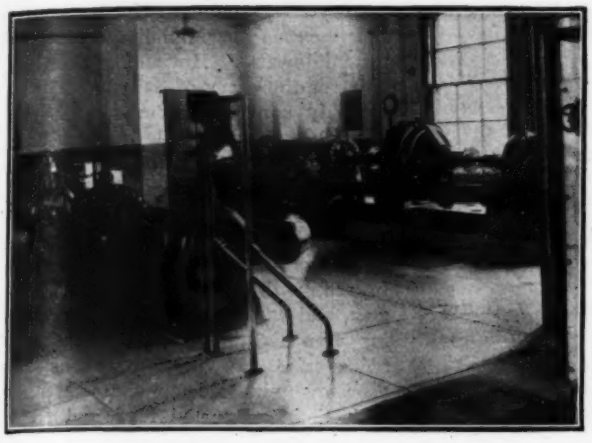
Two-Stage Pump Driven by 100-Horsepower Motor.



Triplex Pump Driven by 50-Horsepower Motor.

In a crooked deep-well hole of small diameter the air lift appears to be the only practicable method, but the extra cost of drilling a larger diameter of straight hole for the first 250 to 300 feet is by no means prohibitive and often warrants consideration.

The deep-well centrifugal pump is generally of considerable capacity and requires a large bore of well. There is usually one stage for each 50 feet of lift and a five-stage centrifugal for a lift of



Two Sets of Motor-Driven Pumps.

Two Centrifugal Pumps Driven by One Motor.

250 feet would probably have an efficiency of about 40 per cent.

Power-driven pump heads with single-piston and double-piston lift pumps have been used for many years for pumping deep wells. When operated by steam such lift pumps generally show low efficiency on account of slow speed and perhaps long lengths of steam pipe, whereas power heads driven by steam engine, gasoline engine and by electric motors show high efficiency. The motor-driven double-piston pump shows on test efficiencies in the neighborhood of 80 per cent from power input of pump to water horsepower, and efficiency of 70 per cent or more including motor.

Data on Typical Installations.

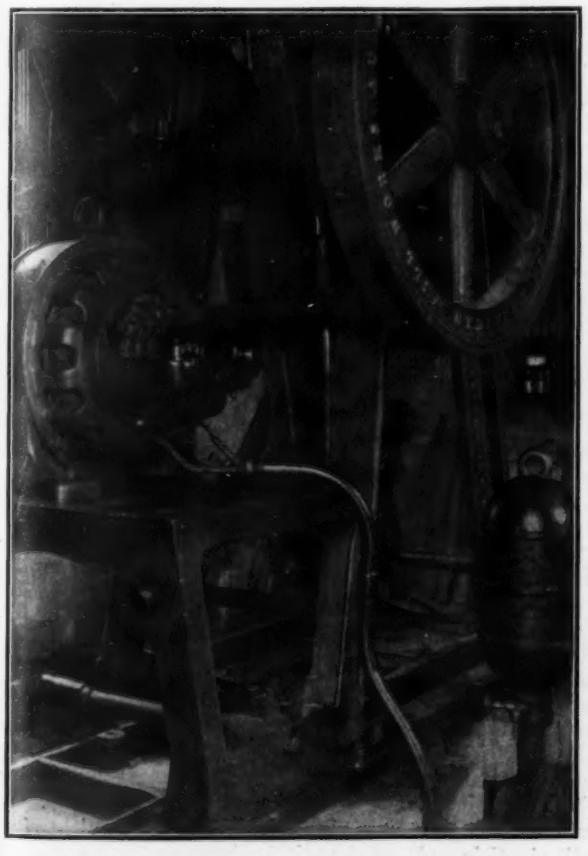
Some interesting figures on city water pumping are contained in reports of tests made on three installations by the Keystone Driller Company, of Chicago. At Gas City, Ind., there is installed one No. 34 Downie double-stroke deep-well pump head, in connection with an 8-inch by 7-foot brass working valve, fitted with Downie conical plunger valves. The depth of the working barrel is 150 feet; the suction below the working barrel is 20 feet, making a total depth to bottom of suction of 170 feet. The pump delivers water into a surface reservoir.

During the month of May 3,830,000 gallons of water were pumped with an energy consumption of 1,500 kilowatt-hours. The total cost for pumping this amount was $46, or 1.5 cents per 1,000 gallons. The pump delivers 225 gallons per minute. Energy is supplied by the Marion (Ind.) Light & Heating Company.

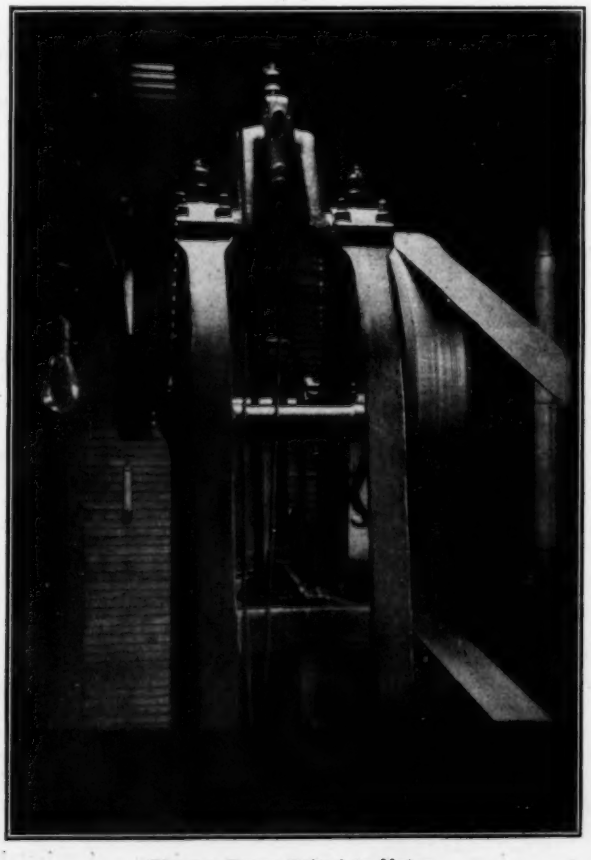
At the water works at Waseca, Minn., a Downie double-stroke pump, No. 34 head, has been installed for some time with excellent results. The working barrel is 5.75 inches in inside diameter and 250 feet long. The following are the results of a test recently conducted on this unit.

Amount of water pumped in May, 2,757,120 gallons.

Amount of energy consumed, 3,590



Plunger Pump Operated by 25-Horsepower Motor.



Plunger Pump Belted to Motor.

kilowatt-hours at 1.5 cents per unit.

Total cost for month, $53.85.

Amount of water pumped in June, 2,419,200 gallons.

Amount of energy consumed, 3,150 kilowatt-hours at 1.5 cents per unit.

Total cost for month, $47.25.

The working barrel at first was placed at 200 feet at which point it got some air; was then lowered to 250 feet, at which point pump just about gets a sufficient amount to supply it.

This pump takes just 15 horsepower and has an efficiency of at least 75 per cent.

A third test was made on an installation at Platteville, Wis. This city has two wells located adjacent to the waterworks station. An 8-inch well adjacent to the pumping station is 1,700 feet deep and is equipped with air lift. The other well, about 40 feet further south, is a 16-inch hole cased to a depth of 300 feet, beyond which the hole continues 9 inches in diameter to 1,000 feet. The latter has been fitted with a No. 36 Keystone double-stroke pump head, 18-inch strokes, and 11.5-inch working barrel located at a depth of about 195 feet.

The pump is operated by a three-phase, 60-cycle, 220-volt, 35-horsepower induction motor, running at 900 revolutions per minute. Electric power for pumping is purchased by the city from the Interstate Power Company, of Galena, Ill. The pump discharges water from the well to two interconnected circular storage reservoirs close at hand.

A 40-minute test of the installation was made with a view of determining power consumption and pumping capacity. The quantity of water discharged was determined from the computed capacities of the two storage reservoirs. The current consumption was read from the station watt-hour meter supplied by the power company, and serving this motor installation only. During this test, pumping from the surface reservoir was discontinued. An ammeter and voltmeter were also connected at the main switch in the motor circuit.

During the 40-minute period, 19,388 gallons of water were pumped at a rate of 484.7 gallons per minute. The power consumption during this period was 15,000 watt-hours, or 773 watt-hours per thousand gallons pumped.

Rate Reduction at Easthampton.

The town of Easthampton, Mass., has accepted the offer of the Easthampton Gas Company, a combination gas and electric company, and withdrawn its petition for a hearing by the State Electric Light Commission on a reduction in rates. The reduction which the company offers will bring the maximum net price down to 11.7 cents, the rate heretofore having been 13.5 cents per kilowatt-hour, for a monthly consumption of 100 kilowatt-hours or less.

Details of a House-Wiring Campaign at Portland.

The Cumberland County Power & Light Company, Portland, Me., began a systematic campaign for the wiring of houses and other buildings September 20. Four propositions are offered to householders, as follows:

(1). Exposed wiring, 6 drop cords, porcelain shades, $17.00. Terms, $2 with order, $2 a month.

(2). Concealed wiring, 7 fixtures, $42.00. Terms, $3.50 with order, $3.50 a month.

(3). Concealed wiring, 7 fixtures, $48.00 Terms, $4 with order, $4 a month.

(4). Concealed wiring, 7 fixtures, $58.00. Terms, $4.83 with order, $4.83 a month.

Fixtures with proposition No. 2 include a pendent hall fixture with bell shade, three-light dining-room pendent chain chandelier, chamber and bath wall-bracket, three-lamp living-room shower, drop tube kitchen light with shade, and porch globe with wall switch. Propositions 3 and 4 call for more expensive glassware, the fixtures being of the same general types. An additional light, with either drop tube or wall bracket may be added for $4. A flush wall switch is installed for $4, and a cellar light and switch for $4.

All work is divided among ten local contractors who have already agreed upon unit prices after having gone over the matter among themselves. The central station gives each householder accepting the offer a handsome portable table lamp gratis.

Solicitation of the business is done by the lighting company's three salesmen, besides a power agent who devotes part of his time to the work. A canvass is first made of all houses not wired, and "lead memos." are filled in by the salesmen as the result of each call. These blanks provide for the householder's name, business, address, etc., and have spaces below for entry of dates of calls, with final blank space to be filled in when the contract is closed.

These memoranda are turned in to the business office daily. Here they are assorted, and the memos. which indicate that the prospect was absent from home, not yet ready to talk business, or willing to consider the proposition on a certain day, are placed in pigeon holes labelled with the days of the succeeding week and month. Each day's work on prospects already solicited and partly convinced of the desirability of an installation, is thus cut out for the salesmen, who take the memos. for the day and call again, as arranged at the previous interview.

In the office is a blackboard 5.5 feet long and 3 feet high, lined off in red, with vertical columns for residences, apartments, other buildings, total and total kilowatts. Horizontal lines provide for the entry of daily, weekly and monthly contracts secured, with their kilowatt capacity, and footings under each of the time periods.

Another blackboard is for the entry of contracts gained for commercial business and appliances. This board is 12 feet long and 6 feet high, ruled in red, with divisions for four salesmen, and each division provides spaces for sign lighting, front lighting and office sales, showing number of each type of unit sold or contracted for, with their connected load and totals.

This board is ruled by days, weeks and months for the year and the figures show at a glance just the amount of business that has been secured the last full week and month, and for the year.

A third device for indicating graphically the progress of business, is a clock face about 3 feet in diameter with dial marked off in spaces of 10 kilowatts each. One hand indicates the total motor load in horsepower at the present date, and the other hand the load one year ago on the same date.

A campaign of nine months recently conducted by the company resulted in securing 715 new contracts, and only three salesmen were employed.

The company's net lighting rate is 8.5 cents a kilowatt-hour, with a minimum charge of $12 a year.

Parcel Checking in Appliance Display Room.

A checking room for parcels, at the display room of the Cumberland County Power & Light Company, which controls the Portland Railroad Company, the traction system of Portland, Me., has been recently introduced, and has been found a source of revenue to the company as well as a great convenience to the traveling public.

The first floor of the company's office building on Monument Square, the point of departure and intersection of street car lines, is utilized as a waiting room and also a display room for lamps, electric appliances, etc., an information counter and a place to pay bills, engage service, and secure renewals of lamps also being provided in the one room. The checking convenience is the most recent feature.

The room is about 15 by 20 feet and is provided with racks for bundles, valises, etc. The place is open from 6 a. m. to 12 midnight, a day man and a night man being in charge. Five cents is charged for the checking of a package for 24 hours or fraction. Shoppers and other visitors to the city make good use of the convenient place of deposit for baggage.

Commercial Practice
Management, Rates, New Business

THE SMALL-CUSTOMER QUESTION.

System for Reducing Cost of Billing, Collecting and Accounting.

Comparatively little effort has been made in this country to secure the business of the very small customer because of the high customer costs inherent in present-day practice. At the recent convention of the Northwest Electric Light and Power Association, H. E. Eisenmenger, who has made a careful study of European practice, presented considerable data on cheaper wiring, flat rates and a feasible billing, collecting and accounting system which he has devised to enable central stations to serve customers with as low a maximum demand as 50 watts at a profit. The latter system is described herewith.

The central stations in this country do not generally have as many small customers as the central stations abroad. They are not soliciting them and where small consumers are coming in without being solicited they are generally not welcomed but rather considered as a burden.

The cost of service to a certain customer depends on the number of kilowatt-hours consumed by him and on the number of watts which he draws from the central station at the time of the central station's maximum demand, thereby necessitating the company keeping a corresponding amount of capacity and investment for his exclusive use. There is, however, a third part of the expenses which is independent of the customer's demand or the energy consumed by him. This part, in other words, is independent of the "size" of the customer. This constant amount which is called the customer expense is formed by

(a) The cost (interest, depreciation, amortization, taxes) of the capital invested in the house connection and in the meter.

(b) The cost of meter reading, meter repairs and meter calibrating.

(c) The expenses for billing, collecting, bookkeeping, accounting and handling complaints.

These "customer expenses" are essentially selling expenses and may be estimated roughly as being somewhere between 50 cents and $1.00 or more per month per customer, according to local conditions. This expense is, therefore, of very little consequence with the large customers but it constitutes the bulk of the total cost of the very small customer who is using less than 10 or 20 kilowatt-hours per month. It is evident, therefore, that any efforts to materially reduce the cost of serving the small customer must tend to lower these customer expenses by simplifying the methods just as has been done in the letter-carrying and other businesses.

One of the most important steps in the case of the letter-carrying business was the simplification of the method of charging by introducing a uniform flat rate of one penny (two cents) per letter to be carried within the country regardless of the distance carried, of the number of sheets and (within certain limits) of the weight, thereby reducing the cost of weighing the letter and computing the charges. In the same manner, we will have to do away in the central-station retail business with expensive methods of measuring the energy consumed and computing the amount paid therefor.

This means a flat rate, that is a rate which charges the customer only according to his maximum demand (measured by watts or by candlepower or by the number of lamps, etc.) and takes no cognizance whatever of the number of kilowatt-hours used. The customer pays for a certain load for which he has contracted and is charged a certain pre-arranged amount for that load per month (or any other period), no matter how long he uses that load during the month in question. His bill is quite independent of the number of kilowatt hours he has used and consequently the number of kilowatt-hours used need not be ascertained.

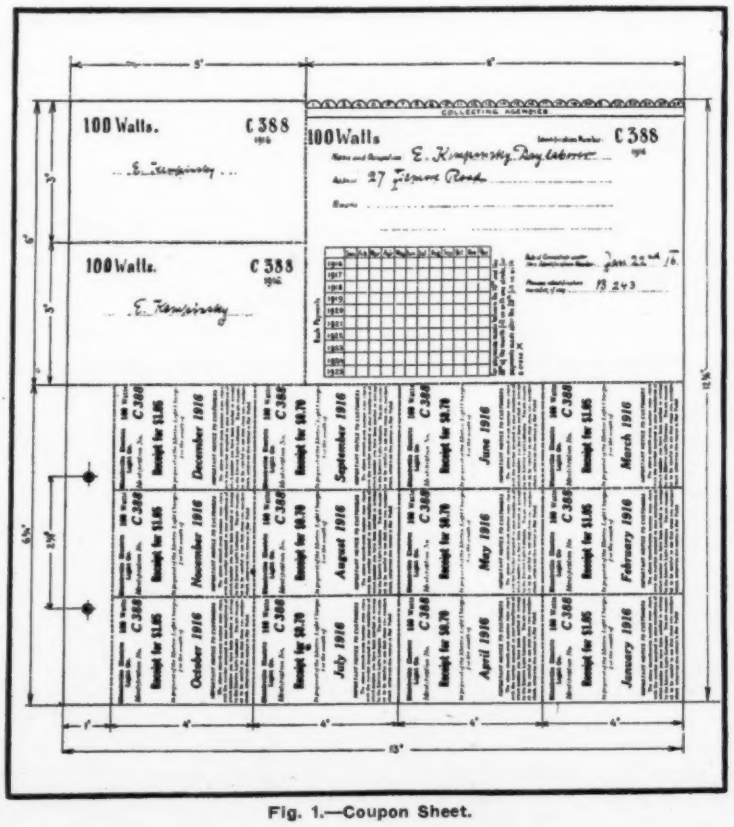


Fig. 1.—Coupon Sheet.

Consequently the flat rate does away with all the expenses incident to the use of an integrating meter, that is with a substantial part of the expenses as mentioned above under (a) and the total of the expenses as under (b). The third part of the customers' expenses as under (c), such as billing, collecting, bookkeeping and accounting, etc., can be very considerably reduced by the department-store methods,

mentioned above and to be described in the following paragraphs.

The principle of the system proposed is that flat-rate customers get no individual ledger accounts and are not treated individually, but collectively in large groups. Instead of getting a page in the ledger the consumer simply gets a card in a card file printed with an identification number and from then on he is treated as a number only, collectively with other consumers. The company knows that every one of these "numbers" has to pay a fixed amount every month. All receipts are printed in advance for the whole year on a cardboard sheet consisting of 12 detachable monthly coupons which serve as a receipt for the customer. Everything is printed on these coupons, even the amounts payable and the identification number of the customer, so that no handwriting or typewriting whatever is necessary on these receipts. The company is not interested in the customer's name, address or other particulars which distinguish him from other consumers, except in emergency cases, for instance if he fails to pay or if he changes the wattage of his maximum demand, etc. It is only in such cases that reference is made to the index card of the customer. No collectors are sent out and the flat-rate customer has to see to it himself that his payment reaches the company's office in time. The system is so devised as to show up automatically the identification numbers of those customers who have failed to pay, by the last date of the period assigned for paying the monthly bills, for instance by the tenth of the month. The customers who have failed to pay are then disconnected. It seems preferable, however, to first mail them a printed note that their payment is overdue and that in case of non-payment of their flat rate plus a fixed extra charge for making out and mailing the notice in accordance with the provisions of the rate schedule they will be disconnected within a certain period.

The principle is here to reduce to a minimum the cost of serving the regular consumer. Every consumer who necessitates individual treatment by not paying regularly, is charged individually the expenses of individual treatment.

In large cities it would work a hardship on the small consumers of this class if they were required to go down town to the central-station's office every month in order to pay their bills. (Payment by mailing checks is, of course, out of the question with this poor class of people and besides would cause the electric company an increased expense for clerical work, postage, etc.) To overcome this difficulty a system of collecting agencies is suggested which are to be spread all over the city in those parts where these small consumers are living. The collecting agency receives every year the printed receipt coupons for the customers in its districts and has to return to the central station every month either the face value of that respective month's coupons in cash or the coupons themselves, of those customers who have failed to pay. The accounting of these coupons is almost automatic and causes very little work so that the collecting agency can be kept by a drug store or some other little store in residential quarters. It can be expected that, as in Germany, these collecting agencies will do the work either for a trifling fee or gratuitously, acting on the same principle as our druggists do when they sell postage stamps. The idea is that by drawing the people into their store they get them acquainted with and accustomed to the store. A man who once is inside of a store is half a purchaser for something he may see there.

Fig. 1 shows a sample of the sheets which are printed for every one of these customers. They are printed on thin cardboard and consist of one large and two small index cards and twelve receipt coupons. All these different parts are easily detachable from each other as they are separated by perforations or a similar method. It is seen from the illustration that the amount payable every month and also the corresponding amount of watts for which he has contracted are printed on the coupon. In the illustration the monthly amounts for the six winter months are higher than those for the six summer months. Full particulars about this detail appear later. It is possible to print the amount of the bill on the coupon, as contracts are not made for any odd wattages, but only for certain standard wattages. Consequently there will be only a certain limited number of coupon cards necessary. If, for instance, the schedule requires that the number of watts contracted for must be a multiple of 25 and that the wattages for which the flat rate applies be between 50 and 200, there would be only seven different kinds or series of coupon cards necessary, viz., 50, 75, 100, 125, 150, 175 and 200-watts. The sheets of each one of these series are imprinted with consecutive identification numbers starting with "one" independent of the other series. This identification number is printed on each coupon and on each one of the three indexing cards. The different series are distinguished from each other by prefixing a different letter of the alphabet for each class of sheets to the identification number. Thus, for instance, "A" might indicate 50-watt consumers, "B" 75-watt consumers, "C"

.....11th, 19....

In case of the 11th occurring on a Sunday or holiday, to be sent on the next following work day

BLANKVILLE ELECTRIC LIGHT COMPANY

Blankville

Gentlemen:

Enclosed pleased find the following coupon sheets containing all coupons beginning with this month and ending with December of this year. Payment for this month's coupons on these sheets has not come in.

.....pcs.	Series A:	No.....	
..... "	" B:	No.....	
..... "	" C:	No.....	
..... "	" D:	No.....	
..... "	" E:	No.....	
..... "	" F:	No.....	
..... "	" G:	No.....	

.....pcs.

The corresponding indexing cards are also returned herewith.

The coupons from all the other coupon sheets held in this collecting agency have been cashed in this month as follows:

			SUMMER.	WINTER	
Series A:	.....pcs	@	$-.50	$-.75	$.....
" B:	..... "	"	-.60	-.90	$.....
" C:	..... "	"	-.70	1.05	$.....
" D:	..... "	"	-.80	1.20	$.....
" E:	..... "	"	-.90	1.35	$.....
" F:	..... "	"	1.00	1.50	$.....
" G:	..... "	"	1.10	1.65	$.....
	.....pcs.				$.....

The total of ..... $..... is being turned over to you herewith.

Yours very truly,

.....

Collecting Agency No.....

Fig. 2.—Printed Form Used by Collecting Agencies.

100-watt consumers, etc. (Instead of this every series might start with another 1,000 or 10,000.) It is also advisable to print the different series on cardboard of different color. In all other respects, apart from their showing different amounts payable and different wattages, the different series of coupon sheets are exactly alike.

The main index card (the large one) is the company's record of the individual customer and is made *out once for all* at the time when the customer is connected. It is not renewed at the beginning of every year, but stays in the company's files. The same applies to the small index cards. The printed coupons on the left half of the big sheet have to be renewed at the beginning of every year as they are used up. Besides the main index cards two smaller subsidiary index cards are printed on the same sheet, which are also detachable. One of these subsidiary cards is for use in the company's office for cross indexing, so that if a customer's identification number is known, his name and address can be found from the main card file, which is arranged by series and numbers, or, if his name is known, his identification number can be found from the subsidiary card file, which is arranged alphabetically. In the ordinary course of events, if nothing extraordinary happens, such as non-payment of bills or change of contract, etc., reference need never be made to the individual customer. The second small (subsidiary) card is used only in case of payment through collecting agencies and is sent out to the respective agency to enable them to find out the identification number of an individual customer in case the latter when paying should have forgotten his number.

Every flat-rate consumer has to select the collecting agency where he wishes to make his payments. The semi-circular tabs shown on the upper edge of the main index card indicate the respective customers' collecting agency, each agency being designated—for the company's reference—by a number. The collecting agency to which the respective customer belongs is indicated in the card file by cutting off all the other semi-circles. It is then easy to find at a glance from the company's card file the cards of all those customers who are assigned to one certain collecting agency, should this be desired.

At the beginning of the year the collecting agency receives from the central station the coupon cards for all the consumers assigned to it. As is seen from the illustration, the coupon card has attached at its edge a strip of cardboard of such size and shape that the collecting agency can file the coupon sheets in a Shannon file. Every coupon card represents a certain value receivable in twelve monthly payments, and the collecting agency is charged in the books of the Company with the respective amount, in the same way as if the cards were merchandise which the collecting agency has received on consignment from the electric light company.

The collecting agency, together with the coupons, receives a printed receipt form, properly filled in, which the agency signs and returns.

The customers are advised to mention their identification number rather than their name, when paying their bills at the agency, but it will not be an infrequent occurrence that a customer when paying does not remember his number. For that reason the collecting agency, together with the coupons, receives the third index card (second subsidiary card) mentioned above, which the agency keeps in an alphabetical file for reference in case

Month of.....19....

First semi-monthly statement: White paper.
Second semi-monthly statement: Pink paper.

..... Collecting Agency No.....
Blankville.

Semi-Monthly Statement
of
Cash and Coupon Sheets

The first semi-monthly statement is sent out by the Electric Light Company to the Collecting Agency on or about the 15th, and the second on or about the 26th of every month. The first statements are printed on white and the second statements on pink paper.

	DEBIT $	DEBIT c	CREDIT $	CREDIT c
1. Balance brought over from the last semi-monthly statement				
2. For coupon sheets returned to Electric Co. since the last semi-monthly statement (1) or for new coupon sheets turned over herewith to the Collecting Agency (2) resp. as follows: (Indexing Cards are enclosed with the new coupon sheets)				
Series A ....pcs.				
Series B ....pcs.				
Series C ....pcs.				
Series D ....pcs.				
Series E ....pcs.				
Series F ....pcs.				
Series G ....pcs.				
Total .. ..pcs.				
3. Cash turned in to the Electric Light Co. (1) since last semi-monthly statement				
4. Balance to be brought forward.....				
Total.....				

Returned (1) — Turned over to Collecting Agency (2) — Value per coupon sheet (3)

Please take the following Coupon Sheets from your files at once and return them to us with your regular communication on the 11th of next month (2):

A. Replaced by other identification numbers for which coupon sheets are enclosed herewith:

.....
.....
.....

B. Dropping out of your accounts entirely:

.....
.....
.....

(1) To be filled in on the first semi-monthly statements only (white paper).
(2) To be filled in on the second semi-monthly statements only (pink paper)
(3) From the following table of values of coupon sheets, closing with month of December:

	STARTING WITH MONTH OF										
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Series A...	7.50	6.75	6.00	5.50	5.00	4.50	4.00	3.50	3.00	2.25	1.50	.75
B...	9.00	8.10	7.20	6.60	6.00	5.40	4.80	4.20	3.60	2.70	1.80	.90
C...	10.50	9.45	8.40	7.70	7.00	6.30	5.60	4.90	4.20	3.15	2.10	1.05
D...	12.00	10.80	9.60	8.80	8.00	7.20	6.40	5.60	4.80	3.60	2.40	1.20
E...	13.50	12.15	10.80	9.90	9.00	8.10	7.20	6.30	5.40	4.05	2.70	1.35
F...	15.00	13.50	12.00	11.00	10.00	9.00	8.00	7.00	6.00	4.50	3.00	1.50
G...	16.50	14.85	13.20	12.10	11.00	9.90	8.80	7.70	6.60	4.95	3.30	1.65

THE BLANKVILLE ELECTRIC LIGHT CO.

....
Tear off along this line.

Month of.....19....

Blankville Electric Light Company,
Blankville.

Gentlemen:—I receipt, herewith, for your semi-monthly statement, which was attached to this slip. I have examined it and found the balance of $..... (value of Coupon Sheets) to your credit to be correct, as well as every single item.

Yours very truly,

.....
Collecting Agency.

Fig. 3.—Printed Form for Semi-Monthly Statement.

a customer desires to pay by name rather than by number.

All index cards are made of a size to fit into standard file cabinets and the coupon cards to fit into a standard Shannon file.

Payments are to be made in advance by the flat-rate customers each month and a certain time limit is fixed for the payment in every month, let us say, for instance, the tenth of every month. The collecting agency then on the eleventh of every month takes the receipt sheets and subsidiary index cards of those customers who have not paid their monthly charge for that month, and returns them to the electric light company's office, together with the amounts paid by those customers from whom the charges have been collected for that month. It is a very easy matter for the collecting agency to pick out from the coupon sheets piled up in the Shannon file, at a glance, the cards on which payments have not been made, without inspecting the individual cards, since on the sheets where the payments have been made, the coupon of the respective month is missing, whereas on the other sheets the coupon is still attached.

The collecting agency is then credited on the company's books with the amounts returned, as well as with the amounts corresponding to all the remaining coupons on the receipt sheets returned, in the same manner as a consignment merchant will be credited with money returned and consignment goods returned.

Fig. 2 is a suggestion for a printed form which the collecting agencies are to use in accounting with the electric light company when on the eleventh of the month they turn in the money collected together with the coupon sheets on which the bills have not been paid. Series "A," Series "B," etc., on the form indicates, as explained above, the wattages of the respective flat-rate contracts.

The values of the coupons printed in the form shown on Fig. 2 are stated, merely as an example, on the basis of a certain set of prices which are computed under certain arbitrary assumptions.

If it is considered necessary to allow a commission to the collecting agency either per coupon collected or as a percentage of the sum collected, the simplest way will be to charge the agency not with the face value, but with the net value, that is, with the commission deducted. In that case the prices in Fig. 2 will have to show net values of the coupons.

The electric light company once a month sends out to every collecting agency the coupon sheets which are to be added to the files of the collecting agency. The electric light company in addition issues periodically statements to the agency about the standing of the mutual account and receipts for money and for coupon sheets received from the agency. The following is to be said concerning these confirmations and statements:

The "Department Store Methods" necessitate a very high degree of standardization and therefore it is necessary that new customers be taken on only by the first of every month and at no intermediate dates unless they pay for the whole month. The same applies to a change of wattage. A few days before the first of the month, the central station sends to the collecting agency the new coupon sheets of all such customers as have applied during the month for payment at that agency or who have changed the wattage of their contracts and belong to that agency. The electric light company charges the agency with the value of these coupon sheets, which, of course, contain only the coupons for the rest of the year and not those of the preceding months of the year.

The account between every collecting agency and the central station changes therefore twice a month at two definite periods and at no other time.

First. Shortly after the eleventh of the month when the collecting agency is credited for cash and for coupon sheets returned.

Second. Shortly before the first of the month when the collecting agency is debited for the new coupon sheets turned over to them by the electric light company.

It is therefore necessary to send out two semi-monthly statements which in the following will be called the first and the second semi-monthly statement.

Fig. 3 shows a suggestion for a printed form which serves for the requirements of both the first and the second semi-monthly statement. If these forms are printed on two different kinds of paper, for instance white

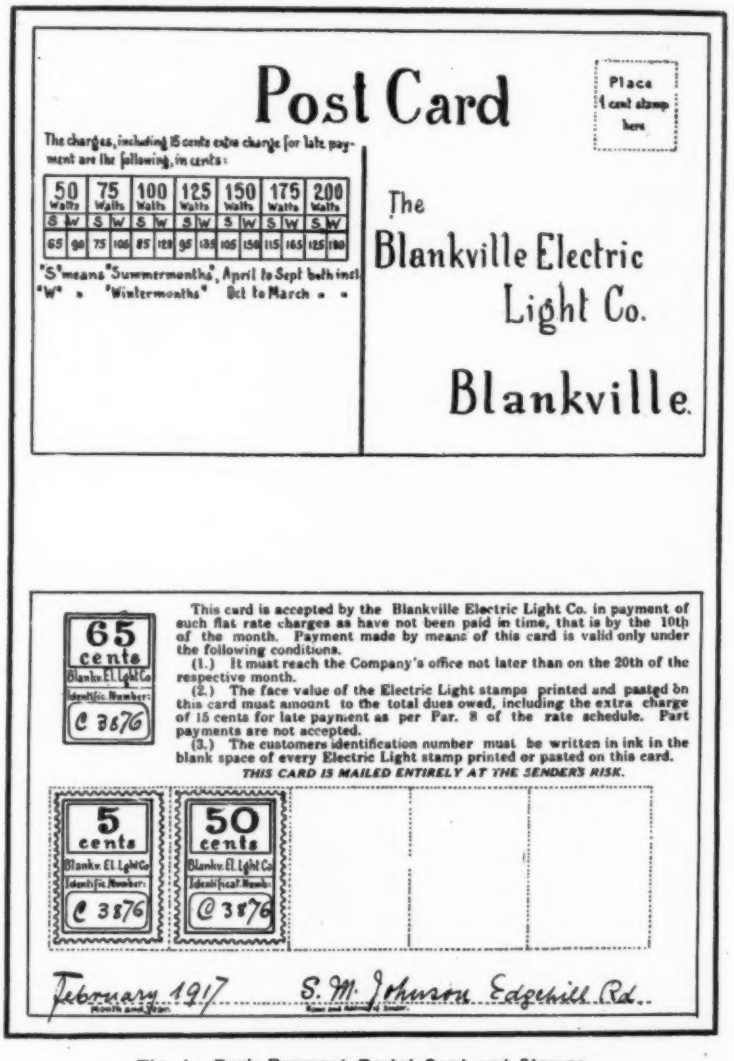

Post Card
Place 1 cent stamp here
The charges, including 15 cents extra charge for late payment are the following, in cents:
50 Watts S 65 W 90
75 Watts S 75 W 105
100 Watts S 85 W 120
125 Watts S 95 W 135
150 Watts S 105 W 150
175 Watts S 115 W 165
200 Watts S 125 W 180
"S" means "Summermonths", April to Sept both incl.
"W" " "Wintermonths" Oct to March " "
The
Blankville Electric Light Co.
Blankville
65 cents
Blankv. El. Light Co.
Identific. Number:
C 3876
This card is accepted by the Blankville Electric Light Co. in payment of such flat rate charges as have not been paid in time, that is by the 10th of the month. Payment made by means of this card is valid only under the following conditions.
(1.) It must reach the Company's office not later than on the 20th of the respective month.
(2.) The face value of the Electric Light stamps printed and pasted on this card must amount to the total dues owed, including the extra charge of 15 cents for late payment as per Par. 8 of the rate schedule. Part payments are not accepted.
(3.) The customers identification number must be written in ink in the blank space of every Electric Light stamp printed or pasted on this card.
THIS CARD IS MAILED ENTIRELY AT THE SENDER'S RISK.
5 cents
Blankv. El. Light Co.
Identific. Number:
C 3876
50 cents
Blankv. El. Light Co.
Identific. Number:
C 3876
February 1917
month and year.
S. M. Johnson Edgehill Rd.
Name and address of sender.

Fig. 4.—Back-Payment Postal Card and Stamps.

and pink paper, one color may be used for the first semi-monthly statement and the other color for the second.

The table given at the foot of the form shown on Fig. 3 as a help for making the computations of the values of the coupon sheets, has been figured out, merely as an example. It does not mean to recommend that these figures should actually be accepted, regardless of local conditions. This table gives the aggregate value which the coupons represent on a coupon sheet beginning with a certain month of the year up to and including December and excluding all previous months, in other words, the amount to be charged (or credited respectively) per coupon sheet sent by the electric light company to the collecting agency (or vice versa) in a certain month. In case of commissions being paid to the collecting agencies the values are to be reduced from face values to net values by deducting the commission.

The account between the collecting agencies and the electric light company is settled by these semi-monthly statements, but the electric light company still has to take care of those customers who have not paid their advance bill within the respective time limit set therefor (in our example the tenth of the month). The procedure with regard to these customers is as follows:

When the coupon sheets of the customers who have failed to pay reach the company's office from the collecting agencies, the names and addresses of these customers are found out from the company's card indices and to each one of these customers is sent a printed postal card (or letter) from the company, informing him that his payments have not been made by the time specified and that the rate schedule calls for disconnection of his service if he does not pay within, let us say, ten more days. The customer is also reminded on that communication that in this case, as per rate schedule, the payment must be made at the company's office and not at the collecting agency, and that—also according to the rate schedule—an additional charge of, say ten or fifteen cents, will have to be paid by the delinquent customer. The reason for this additional charge is the fact that collecting in this case requires extra office work, the cost of which is not covered by the regular rate.

Even in the case of a customer neglecting to make his payments in time at the collecting agency, he may be saved the trouble of going down town to the company's office and it can be made possible for him to pay at the collecting agency. The electric light company would in that case have to issue stamps after the fashion of the postage stamps which represent a certain value printed thereon and are for sale at their face value at the collecting agencies. The customer buys the necessary amount in "electric light stamps," pastes them on the text side of a postal card and mails them to the electric light company. The postal card itself can have an "electric light stamp" imprinted with the minimum value payable and it will then be sold at the corresponding price at the collecting agency. (See Fig. 4.) The postal card has the company's address printed on the address side and may or may not have a government one-cent stamp imprinted so as to be ready for mailing. Space is provided on each stamp for the customer to inscribe his identification number in ink, before mailing it. This serves the double purpose of informing the electric light company by which customer the payment is made and of preventing theft of stamps and cards after they have been mailed. This parallels the cancelling of government postage stamps, rendering them useless for any other customers.

A customer who has not paid by the twentieth of the month is liable to disconnection without further notice. He should be allowed the option, however, even at that late date, to retain his electric service if he pays his back bills plus another extra charge, of let us say 60 cents, for the expense of sending out wiremen to disconnect his installation, and for the incidental clerical expense.

Customers who are habitually late with their payments are undesirable customers. In order to avoid the appearance of discriminating against the individual customer who is frequently delinquent the rate schedule should contain a clause that such customers who have neglected in a certain number of months during the year to pay in the regular way at the collecting agency will be disconnected without notice at the next following failure to pay at the regular time. Failure of payment at the regular time is indi-

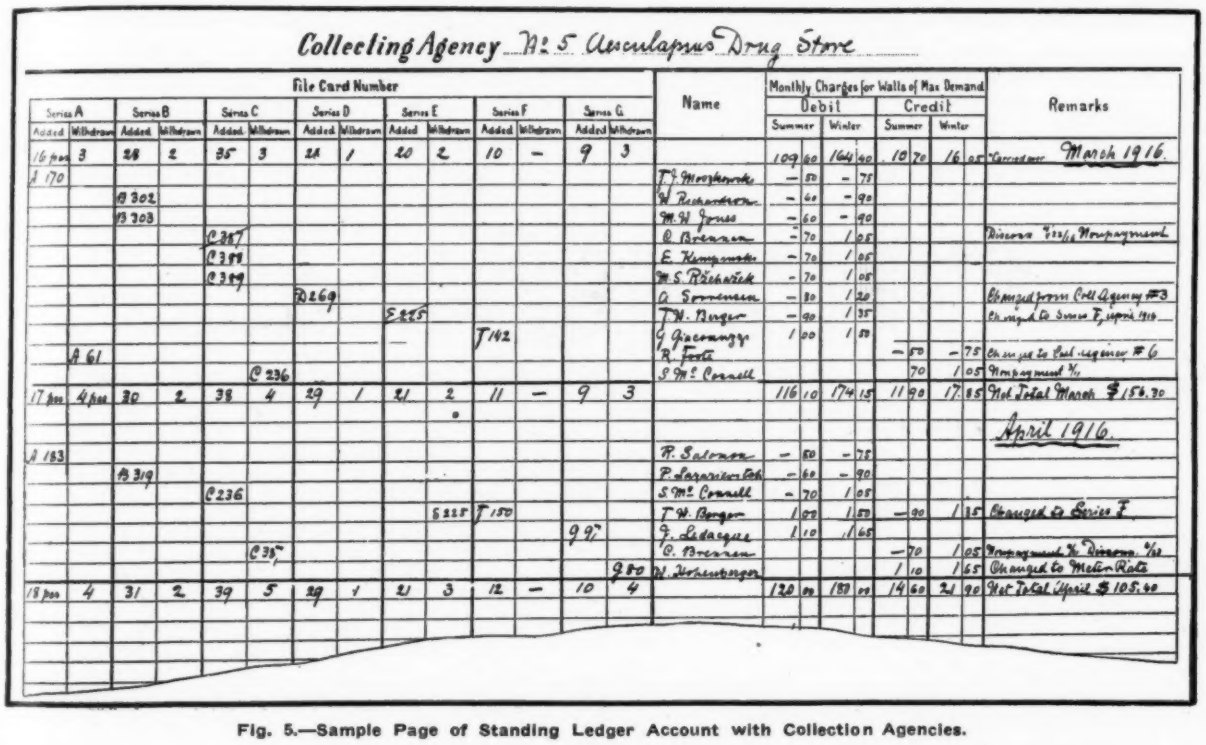


Fig. 5.—Sample Page of Standing Ledger Account with Collection Agencies.

cated on the customer's main index card in the space allotted therefor. The receipts of customers who do not pay at the proper time should be perforated in a certain way or should otherwise be made to show the back payment, so that a customer can always prove from his receipts when he has paid in time.

If a customer has failed to pay at his agency within the time limit and has to receive a dunning card, as described above, this is noted on his main filing card by making a pencil or ink mark in the space allotted for that purpose on the card. This space is shown in the illustration, in the left hand lower corner of the main index card, where a small square is set aside for that purpose for each one of the twelve months of a number of years. (The slight cost of this extra clerical work is also to be covered by the above mentioned extra charge made to the delinquent customer.) This enables the company to disconnect such undesirable customers without being unnecessarily severe on such flat-rate consumers as make their payments late only occasionally on account of forgetfulness, temporary money tightness, etc.

At the end of the business year it will become necessary to provide the collecting agencies with new coupon sheets for the old customers. It is not necessary to exchange the index cards. The issue of new coupons to the collecting agencies at the end of the year is the only periodical office work concerning the individual customer in the regular course of events. It happens only once a year and, as will be seen from the following description, is performed in a few seconds per customer, without necessitating any handwriting or typewriting whatsoever.

The sheets of a certain series (that is, for a certain wattage), for the new year, are piled up in front of the clerk entrusted with that work in numerical order as they come from the printer. One sheet after the other is drawn off from that pile and it is ascertained from the respective index card in the main file (also arranged in numerical order), which collecting agency is in charge of the customer with the respective number. The coupon sheets are then arranged in groups according to the collecting agency to which they shall go.

Certain numbers will be missing in the main index card file either because the customers have dropped out or because the cards may have been spoiled originally in making them out. New sheets bearing such numbers as are not contained in the card file are thrown away; their numbers are not to be used over again. This has the following advantage:

Let us assume that of a certain series up to the end of a certain year the numbers 1-500 have been used. The printing of the complete coupon sheets as shown in Fig. 1 is then necessary only for all numbers above 500; numbers 1-500 are printed without the three indexing cards. This saves the work of tearing off and throwing away the index cards of 500 coupon sheets.

A check may be obtained on the accuracy of this work by finally counting the coupon sheets to be sent out to each collecting agency and comparing it with the number of index cards which are made out for the respective agency. (This latter number can be ascertained from the tabs on top of the main index cards.) The two figures must check for every one of the collecting agencies.

A further check can be obtained by making joint ledger accounts for all customers paying at a certain collecting agency. Fig. 5 shows a sample page of this account. Before entering into the description of the system, it should be emphasized that the same principle is maintained here as with the card file, viz., that periodical entries for the individual customers are entirely avoided. The individual customer is entered only once when his name is added to the respective group and then no more cognizance is taken of his name or card number, etc., until he, maybe after many years, leaves the group by being disconnected or by being transferred to another group.

Every collecting agency has an account of its own and this account is split up according to the series, that is, to the wattage of the flat-rate customers. This is shown in the left half of Fig. 5 under the heading, "File Card Number." The identification number of every customer added is entered in the column "Added," under date of that month. No further reference is made to this customer until he ceases to belong to that series. In that case his identification number is entered in the respective column under "Withdrawn," as shown in a few examples. A total of all the columns is made just before the "first statement" is sent out, about the middle of every month, in such a way that the number of customers in every column is counted up and added to the respective balance carried over from the previous month, as shown in Fig. 5. Since it is exactly known how much every customer has to pay every month these figures alone would be sufficient for an account with the collecting agency. For instance, at the time of sending out the first March statement at the middle of March, a total of 17 identification cards of Series A had been sent to the collecting agency, a total of four had been withdrawn and the collecting agency must, therefore, have sent in the money for 13 customers of Series A on the eleventh of March. In the same manner the amounts due from the customers of the other series are figured out and added up to give the total payable by the collecting agency in that month. This total must check with the amount that had been turned in by the collecting agency on the eleventh of the month, which amount is to be receipted for by the "first statement."

To make accounting easier and to avoid mistakes, it seems advisable to enter the charges in dollars and cents for every customer in the same line of the ledger where his identification number is mentioned. This is shown on the right hand side of Fig. 5 in column "'Monthly Charges for Watts of Maximum Demand." The amount payable by the respective customer is entered on the debit side at the time his identification card is added to the cards held by the collecting agency, and on the credit side when his coupon sheet is returned from the agency to the electric light company. The difference between the monthly totals on the debit side and the credit side give the net amounts payable by the collecting agency. The winter totals are to be used in the winter months and vice versa. It is theoretically unnecessary to add the names of the customers as shown in Fig. 5, as the names are shown on the index card anyway, but the entering of the names will help to avoid errors and if such errors do occur, it may oftentimes help to find them out.

If every card number in the "Added" column is crossed out by a light stroke in the place where it was originally written as soon as the corresponding entry is made on the "Withdrawn" side (which may be many months later) this will be a further help to find out any errors if discrepancies should occur. One has then only to run down every "Added" column, leaving out those numbers which have been scratched out and one can read off in consecutive order the numbers of all the coupon sheets which the collecting agency is holding at that partiular time.

Appliances Used in Canal Zone.

The Electrical Division of the Panama Canal is arranging so that employees of the canal can purchase electric irons and other household electrical appliances for use in their residences, which are supplied with electric current from the hydroelectric system of the canal. As a rule, flat rates are charged for energy used by each appliance, the rate being determined from estimated average consumption.

SUCCESSFUL COMMERCIAL MANAGERS.

Henry L. Coleman.

Public utility corporations operating in thickly populated localities, outside of the larger cities, encounter many difficulties in management and in engineering development that requires exceptional ability to overcome. It frequently occurs that one utility company will serve a number of cities and many rural communities where the conditions and requirements are totally different in each case. How such conditions have been brought to a successful culmination by individual perseverance, and ability in business and engineering affairs is well illustrated by the subject of this sketch, Henry L. Coleman, who has been general manager of the Empire Gas & Electric Company since 1910 and has served in various other capacities for the past fifteen years.

This company furnishes light and power to ten cities and towns as well as to many rural communities through the central part of New York State. The main office is located at Auburn, N. Y., and nine other offices are distributed throughout the territory served by the Empire company, all of which are under the direct supervision of Mr. Coleman. Not only all of the offices, but the entire business staff and engineering department are under the direction of the general manager. New-business departments are mantained in the district offices, which are responsible for the solicitation of business of an ordinary nature. These departments as well as the engineering, constructon, meter departments, etc., have department managers.

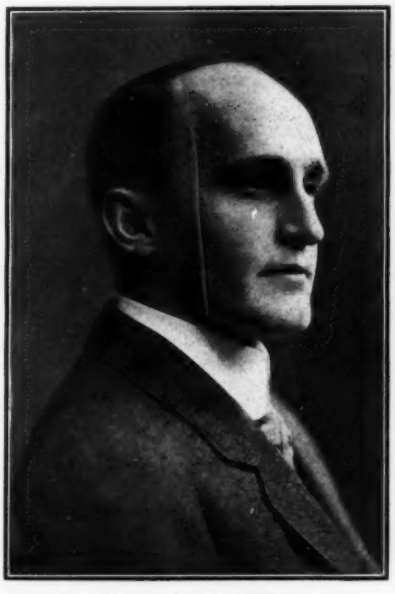
The Empire company has eight sources of power, including four steam generating stations, two hydroelectric plants, and Niagara Falls and Salmon River power, which are all more or less interconnected by means of transformer stations and frequency changers. It can be readily realized that the upbuilding of such a system, in addition to the gas end of the business, covering several hundred square miles of territory has required the services of a man with exceptional executive and engineering ability and the general manager has been the "power behind the throne."

Mr. Coleman's ideas on the conduct of a large public utility are best explained by quoting his own words:

"I believe it is the first essential of a utility corporaton to gain public favor and confidence by its integrity and I always insist on my employees keeping their promises regardless of the cost to the company. The department managers have full authority to close business propositions and settle complaints unless something of unusual importance transpires. Under ordinary conditions I never ask them to consult with the main office as I have known of cases where such conditions obtain, to cause much delay and the loss of respect of the customers.

"It is further my belief that utilities corporations should be factors in every community and that employees should have sufficient individuality and prestige so that each one is recognized and the company as a unit forgotten. We have no private offices and in every department there is always some one present whose duty is to direct callers to the proper person without delay and confusion."

Mr. Coleman has inaugurated many features connected with the company's service, one of which, the Information Clearing House, is maintained in the



Henry L. Coleman,
Manager Empire Gas & Electric Company.

main office for the especial benefit of patrons. Here a complete technical library is maintained and leading engineering magazines are kept on file. The engineering department is always at the disposal of customers for any advice, either connected with electric or gas service, or on any other engineering subject. For example, a customer can seek advice on heating and ventilating systems, building construction, sewers, or even get an abstruse mathematical problem solved. This service is absolutely without charge. It may be further said that a prospective customer who wishes two 20-watt lamps or a sewing-machine motor installed in his home receives the same courtesy as a manufacturer asking advice on the equipment needed for an installation of 1,000 horsepower in motors.

Another feature that receives a great deal of attention is telephone calls. All inquiries are transferred by the switchboard operator to a man who keeps posted on all activities of the company and who can answer all questions at once without the annoyance to the customer of being connected in turn to various departments.

Especial attention has been given to the power development and such concerns as the International Harvester Company, Columbian Rope Company, American Can Company and others of equal importance have electrified their plants and are on the Empire Gas and Electric service. Some of these plants have been described in recent issues of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN.

Mr. Coleman is active in civic matters —takes great interest in educational movements and has organized an engineering club for the benefit of his employees. He is a member of several prominent clubs and despite his strenuous duties will receive an acquaintance at any time and friends are always more than welcome in his office.

Flood Lighting Proves Profitable in Louisville.

The Louisville (Ky.) Gas & Electric Company has had a number of projector lighting installations made in the city, the first in Louisville and in that section of the country. As a trial order the Louisville Gas & Electric Company purchased seven units and solicited the business. These have been disposed of in installations made and more have been ordered. By the time these are put in the electric company will turn the business over to the contractors.

The first of these installations, consisting of five of the General Electric Type C projectors, focusing, and five 500-watt lamps, has been erected on the top of a Fourth Street building, and the light is so directed as to illuminate the front of the Bernheim Building, opposite. It is faced with tile with rather elaborate designs carried out and the illumination serves to call more attention to it at night than it gets in the day time. The installation represented an outlay of $125 and the current bill runs to about $18 monthly. A tire-service house has similarly lighted up one of its signs along Eastern Parkway, a much traveled motor road, and the usefulness of the sign has been much increased. The cost of the installation was about $25 and the light burns until about midnight. The same company is preparing to illuminate the remainder of its bill boards in the same manner and the system is attracting a great deal of comment in Louisville.

New Boston Edison Contracts.

New contracts for power and lighting have recently been secured by the Boston Edison Company as follows: Edward T. Ward Company, steel workers, 120 horsepower and 600 lamps; Riker-Jaynes Company, Roxbury, 100 horsepower and 700 lamps.

Electrical Construction

BUSINESS HINTS FOR THE CONTRACTOR AND DEALER.

By G. D. Crain, Jr.

Price Goods on Display.

Although most dealers in electrical merchandise fail to do so, there seems to be no really good reason why items on display in the show windows should not carry price-tags, as well as other information. The man who stops to look in a window at a small motor intended for use on a sewing machine, for instance, undoubtedly thinks of its possibilities in connection with relieving the work of his wife at home; but before he can make up his mind as to whether he ought to buy it, he must know what it costs, for in 99 per cent of the cases, his purchasing capacity is limited.

The theory of not pricing is that the customer will be so interested, through the display, that he will come into the store, ask for a price, and give the salesman a chance to mesmerize him into purchasing, even if the figure is more than he had intended to pay; but, as a matter of fact, the average person hesitates to go into a store, ask a price and then walk out without buying. Most men are that way, though there are many women who do not hesitate to inquire about goods they see in the window.

The man looking at the sewing-machine motor, and knowing nothing of the cost of such goods, is more likely to err in overestimating the cost than in fixing it too low. If this is the case, the store loses sales that might have been made had the price been given, for he will go away, assuming that it is too expensive for his purse, instead of giving himself and the store the benefit of the doubt on this score. Had the price been given, the store could have lost nothing, even if he did not respond; whereas if the quotation seemed to be attractive, a sale would have been created, and it would have taken little or no effort to have sold the goods. The purchaser who sees something in the window that he wants—and this description applies to most items of electrical merchandise—is held back from buying only by the consideration of cost; and hence if the price is immediately put within his limitations, he will walk in and buy.

Some dealers take the ground that it is good business to quote a price only when a reduced quotation is being offered, as at the end of the electric fan season. But while this might be true of a lot of staple articles the prices of which are familiar to the general public, it is not true of electrical goods, for the reason that the man in the street seldom knows the cost of a sewing-machine motor, an electric toaster, a vacuum cleaner or anything else. These things are relatively new.

The window display is intended to give information about the goods, and to arouse interest as much as possible. The price is the most important piece of information there is, because it determines whether the customer is going to buy or not; and hence leaving it out is illogical, and bars the way to many sales that might be made easily, were it to be given.

Fans in the Off Season.

How do you handle your fans during the off season, so as to insure their being in tip-top condition when warm weather comes again?

Do you take good care of them, or do you merely shove them away out of sight, with the chances favoring their appearance being below par next year, and a reduction necessary in order to move them?

A successful fan dealer—who, like most others, is carrying over a good-sized stock this season because the weather has been cooler than usual—makes a point of going over his entire stock, and putting every fan in good shape. It is cleaned and oiled, and is then covered with a paper sack, of the sort used for hats. The ends are twisted tightly, so as to keep out the dust and dirt, and the name and size of the fan are marked on the outside. They are then put away, but if there should be a late-season call for a fan, the one wanted can be located without having to open the packages.

The advantages of this method are also that the fan can be sold and started up at the beginning of the next season with a minimum of delay. It will still be necessary to test it before putting it into use, but it will take only a fraction of the time that would be needed if repairs and adjustments had to be made.

The time spent in putting the fan stock in good shape now will be well repaid by the greater ease in handling fan business next summer.

Popular Motors.

Supply and demand determine the value of most things, or at least the range within which the price moves. The dealer does not want to tie up his capital in a line of goods which do not move readily, and, conversely, he can afford to be content with a smaller margin on those which sell promptly, and on which there is a rapid turnover and a consequent multiplication of profits.

These considerations are largely the guide of the most successful used-motor dealer in a large city of the Middle West. He has a good many thousand dollars tied up in second-hand machines, which he overhauls and rebuilds before putting into use again, and his experience is suggestive to others.

"The most popular motor sizes in this market are 3 to 5 horsepower," he said, "and consequently we make more money on these than on larger or smaller sizes. We turn our money over fast, and for this reason we are able to pay more for motors of that capacity. A big motor, say over 10 horsepower, is not a good buy unless it can be secured at a low price, because it will have to be held longer before a sale can be made. The same considerations apply to alternating as against direct-current equipment, the latter seldom being in strong demand.

"If the dealer will consider the supply and demand in the selling market when he goes out to buy motors, he will run less risk of getting dead stuff into his shop, and will be surer of having a stock that he can keep turning over rapidly and making some money out of all the time."

The Right Kind of Advertising.

Everybody in the electrical business is familiar with the tremendous creative effect of the right kind of publicity; and hence every dealer and contractor is ready to spend some of his own money for advertising. The usual trouble is that he does not know exactly how to advertise, or what to say after he has bought the white space in which to put his announcement. Some of the manufacturers furnish copy and cuts, and even electros, mortised for the dealer's name and ready for use; but, frankly, a great many small dealers find these ads too ambitious for

their use. What they would prefer would be a larger number of small ads, which could be inserted in their local newspapers at a reasonable charge.

A successful dealer and contractor has decided, however, to spend $750 during the next twelve months for advertising. That is a considerable amount for a comparatively small establishment. At the rates which are quoted in his town, this amounts to 15,000 lines, divided among three papers.

The first of his ads, which struck a new note in local electrical advertising, was run recently, and attracted considerable attention. It was really a news item, as far as style was concerned, only the head-line and the name at the bottom being displayed. The remainder of the announcement was a straightaway description of an interesting installation in a new retail store, special reference being made to the new-type fixtures which had been provided. There was no exaggerated claim made regarding the ability of the firm, but just an interesting, "newsy" statement of fact about this particular store.

The head of the concern plans to run a series of these ads, telling about the interesting work which his company is doing. He believes that this will be more suggestive to the readers of the papers, and will bring in more inquiries, than simply using big type to announce that the concern is in the electrical business, without saying anything specific, or offering any suggestion on which the prospective customer might hang an inquiry.

Co-Operation Between Contractors and Central Stations.

One of many important topics considered at the recent convention of the New England Section, National Electric Light Association, was co-operation between contractors and central stations. A joint committee of central-station men and electrical contractors of Massachusetts presented a series of recommendations that were read by Walter L. Mulligan, of the United Electric Light Company, Springfield, Mass.

These well considered and important recommendations were, briefly, as follows: 1, that central stations be urged to arrange local get-together meetings with contractors, at which business methods and business getting would be discussed; 2, that central stations should confer together on the adoption of more uniform working rules affecting their relations with contractors, so that differences in requirements for the same class of work be standardized; 3, that the Contractors' Association have lists of its members who are licensed contractors printed, to be distributed by the central stations to all inquiring for available contractors; 4, that where business is being developed by a contractor on his initiative, and the co-operation of the station is necessary in locating services and meters or furnishing information, etc., the contractor should feel free to ask the help of the station without fear of disclosing his prospect, all inquiries to be treated confidentially; 5, that central stations prepare a list of unwired houses for use in their campaigns for business, and that they be open to contractors, also that central stations employing wiremen and appliance solicitors work in harmony with contracting interests without partiality; 6, that conferences on prices and methods for house-wiring campaigns by held by the two parties; 7, that contracts for additional wiring after the original central-station-financed contract has been performed be left for adjustment between contractor and customer; 8, that on business financed by the contractors, the lighting company work with the contractors to ascertain the credit of prospects, furnishing information in hand; 9, that when contractors secure new business which means an unusually expensive line extension, stations canvass the locality to secure added business to warrant the extension; 10, that a permanent committee be established, of two members from each interest and a fifth selected by the four, to be arbitrators in matters needing adjustment; 11, that it is recognized that the province of the station is properly to sell current and that of the contractor is to wire buildings and sell supplies and appliances; should the dealers not take proper initiative, the case is to be referred to the arbitrators.

The recommendations were satisfactory in the main, except the last one. F. H. Smith, Worcester, Mass., said that unless the contractor can demonstrate his ability to handle the appliance situation, the lighting company should continue in the business. R. P. Ingalls, of the Simplex Electric Heating Company, Cambridge, Mass., disapproved of any plan to keep central stations out of the appliance business. If goods are sold at or near list prices, there would be no difficulty between the interests, he thought.

L. J. Chase, Concord (N. H.) Electric Company, approved the recommendations except the last. He said it is hard to harmonize the differences with contractors because of jealousy among the contractors themselves. J. A. Hunnewell, Lowell, Mass., told of a plan by which harmony has been secured. All local contractors met weekly with the central-station management. Here the former found ready adjustment for moot questions. All work originating with the company is distributed as equally as possible among the contractors, only those not having a fixed place of business, with telephone, being eliminated.

E. R. Davenport, Narragansett Electric Lighting Company, Providence, R. I., did not blame contractors for objecting to the free supply and renewal of lamps. His company is selling this year 200,000 Mazda lamps at list prices. In working out a house-wiring campaign contractors presented bids which when checked up with prices in other cities were accepted. He did not approve of the lighting company engaging in wiring. "Give the contractor a show, and you will get co-operation from him," said Mr. Davenport.

Mr. Smith, of Worcester, stated that the lighting company there is wiring 100 old houses a month. Local contractors submitted their standard prices and the central-station salesmen proceeded to get the business. When secured, the work is advertised by being posted at the office and is given to the lowest bidder for the job. At the end of the year, the difference between the two sets of contracts is refunded to contractors pro rata, less five per cent for soliciting.

A. T. Page, supply dealer, Hartford, Conn., held that appliances should be sold by the central station, providing they are sold at a fair profit. It is easy, he said, to get 50 cents on an iron, or the 10-per-cent margin on a motor, rather than give away the profit. He did not approve of making a central station's customers pay for lamps through the necessary advance in the kilowatt-hour rate that is charged for lighting.

C. H. Carpenter held that the small central station has a different problem from that of the city company.

C. R. Hayes, Fitchburg (Mass.) Gas & Electric Company, advocated get-together meetings, with the local wire commissioner in attendance, and the discussion of present-day problems rather than old scores. The contractor, though an excellent adjunct to the central-station business, and excellent as a solicitor, exists only because of the central-station industry and should not be accorded favoritism as a class.

Eugene Carpenter held that it is vital to the central station that appliances sold be of the highest efficiency. He believed that dealers should handle them, but lighting companies supervise their quality. He thought it might be of mutual advantage for the central station to aid contractors to procure wiring jobs in slack seasons.

C. R. Hayes advocated the proposed lower-cost methods of wiring, but held that contractors should be enabled to do it at a profit.

Houses Wired With Concentric System in Boston.

The Boston Edison Company has completed the installation of three houses in its territory, on the Stannos or bare-concentric-wire system. Some time ago the company secured a special dispensation from the Boston Wire Commissioner and the Boston Board of Fire Underwriters to wire three houses as an experiment. The understanding was that they should be single-family homes.

Two of the houses are in Dorchester and one in the Jamaica Plain district. All are occupied by their owners, one being a single wooden cottage house, and two brick houses in a block.

Service was entered in the usual manner through service and meters on the standard wiring system. From the meter on, concentric wire is used.

The conductor is No. 14 rubber-covered, tinned-copper sheathed, with cotton braid between sheath and rubber insulation. An order for 5,000 feet was placed last spring.

The conductor has a diameter of 7/32 inch.

"Twistons," sections of tinned copper wire with a spiral of tempered metal at one end, were used to make the connections at switches and outlets. These devices were obtained from abroad.

The method of making connection was to strip a section of the wire, cutting away the sheath and insulation, securing the copper strand to one terminal, and the twiston, with spiral securely hugging the sheath, to the other terminal. The wire was secured to the wall of the room by means of small brass clips with two screw eyes in one end and a rounded clamp at the other. These were either screwed or nailed. Where two conductors were run parallel to one another, as was the case in connecting wall brackets, a double clip of the same sort was used. These clamps were of the type used in automobile wiring, and were procured from the automobile supply houses.

Each of the houses was wired with about 25 outlets, regular ceiling fixtures, wall brackets and receptacles. All wiring was run on the surface of walls, so far as possible over door casings, baseboards or picture moldings.

The policy was to avoid low wires, subject to mechanical or mischievous injury. Protection at the angle of baseboards, where a wire came up through the floor to a wall bracket, was afforded by a section of brass tubing inclosing the wire.

Standard fittings were used in every case, no other fittings being as yet available, though a special line is soon to be offered by manufacturers.

Special attention was given to the bonding and grounding of the sheath by ground connection in addition to the regular service ground on the water pipe back of the water meter.

The outward aspect of the work is simple and unobtrusive. The single wire is carried down the wall to wall connections and either returns in a parallel line or else is carried down to the baseboard, continuing thence to a point below the next outlet and carried thence directly up and through this connection to the picture molding. As above stated, care was taken to avoid low wires, within reach of chairs or other movable furniture. The shell, being thin, is liable to injury, disfiguring the installation.

Contractors' Co-operative Window Dressing in Boston.

Beginning October 15, an expert window trimmer will be employed by joint subscription of a number of dealers in electrical goods, and contractors, in Boston (Mass.) territory.

The trimmer will make his headquarters at the office of the Boston Edison Company and his work will be co-ordinated with the company's window dresser, in that displays of the same goods from week to week will appear in all the dealers' shops and also in the windows of the Boston Edison Company's 15 stores simultaneously.

Each contractor will be assessed for the dressing of his own windows on the basis of size of windows, but the smaller dealers will have the same service performed for them free of charge for one month.

The project involves a year's advertising campaign. Supplies will be procured by the contractors from their regular jobbing connections, except that the same goods may be procured, by smaller dealers, from the Edison Company if advantageous.

City Inspectors Cover More Ground With Automobiles.

A series of complaints which have been received by the city administration recently from people who have been forced to pay for inspection of electrical installations in their homes in order to get the current turned on promptly, has resulted in Louisville, Ky., supplying two electrical inspectors it employs with automobiles which enable them to get over the ground much more rapidly. In this way many people have been enabled to save the $1 fee which inspection by fire insurance underwriters' men has cost them. The Board of Public Safety, which controls this department, has made an announcement explaining the manner of operation and the fact that city inspection is free, while inspection by the underwriter's representative involves the charge.

C. C. Childers, president of the Electrical Clearing House, reported that the city, the contractors' association and the Kentucky Acturarial Bureau have succeeded in putting in force in Louisville virtually every provision of the Code. This is an item which is working out to the material benefit of the contractors and is serving to net them more than where the Code is enforced in a more or less lax manner. The more rigid inspection has resulted in numerous orders for removal of old portions of installations and their complete replacement.

Among the Contractors.

The Keokuk Armature Works has moved its shop from 413 Johnson Street to 1001 Johnson Street, Keokuk, Iowa, thus increasing its floor space about two and one-half times. This firm, of which W. G. Carney is the enterprising manager, has built up an excellent business in the repair of all kinds of electrical equipment, and the manufacture of armature coils. In addition, the firm will now be enabled to undertake the repair of automobile starting, lighting and magneto equipment. It is also expected to handle electrical supplies, and do general electrical contracting.

The Blumenthal-Kahn Electric Company, of Baltimore, Md., has recently been awarded some very important business. The concern will wire the new Parkway Theater, on West North Avenue, Baltimore; J. B. Scott is consulting engineer. This installation includes, along with the regular wiring, a storage-battery plant for the operation of a talking-machine device to be used in connection with the moving pictures. There is also a motor-generator set and several dimmers. The job is conduit work throughout. The firm has also been awarded the contract for the wiring of the Delmar Theater, at Delmar, Del. The company is just completing the wiring of the Easton Emergency Hospital, at Easton, Md. The feature of this work was the installation of the latest Holtzer-Cabot silent nurses' call system.

Great Increase in Cost of South African Electrical Supplies.

Electrical supplies used in the mining districts of South Africa have heretofore been obtained from the continental countries of Europe, chiefly Germany. The war having practically stopped all these shipments, the South African electrical needs are being supplied from England and America at greatly increased cost. The increases in price vary from 20 to 300 per cent for different classes of goods. Their quality, however, is greatly superior to that of the cheap supplies formerly imported.

The American consul at Santiago, Cuba, reports a constantly increasing demand for electrical apparatus and supplies in that city and throughout the interior of the island, particularly on sugar plantations, where many improvements are being made.

Public Service Commissions

Conducted by William J. Norton

CALIFORNIA.

Pacific Telephone & Telegraph Company. An investigation into the rates of the Pacific Telephone & Telegraph Company covering the entire state opened with the hearing held October 5. A complaint was filed with the Commission by the city and county of San Francisco, and subsequently the company asked the Commission to conduct an investigation and fix rates for its entire system within the state, alleging that it would not be fair to consider rates for one exchange separate from its system, which is state-wide.

Hollister Water Company. The Commission reaffirmed its former holding, that it has power to fix utility rates regardless of contracts and refused to grant the application of the town of Hollister for a rehearing of its complaint against the water company. The Commission recently ruled that Hollister must pay the water company $100 per month for fire service. The town contended that the franchise of 1875 granted to the company provided for the use of water for fire service free forever.

IDAHO.

Swan Creek Electric Company was authorized to enter territory served by the Utah Power & Light Company. The latter company entered an objection to the application and showed that it is furnishing adequate service in the territory in question, and that the revenue to be obtained is insufficient to sustain one company, much less to sustain the business of two companies. This statement of the situation is practically admitted by the Commission, but it gives more weight to the present difficulties of the applicant. The applicant, some time prior to the passage of the Utilities Act, made an expenditure of $3,000 in constructing a plant and system, intending to extend its service into the territory it now seeks to enter. The income from the field now served by applicant is insufficient to pay expenses, and unless it is permitted to make the extension into other territory, as desired, it will be compelled to abandon its operations entirely.

The Commission says: "We have no desire to impair in any way the investment of the existing utility, but it is a matter of the existence of the petitioner company, as the evidence shows clearly that unless petitioner is permitted to make its proposed extensions, it must cease operations, and this will deprive Fish Haven, Laketown and Garden City of the service they now enjoy, and which the testimony shows they are using very extensively. If the granting of the certificate herein applied for would deprive anyone of a service which he now enjoys, such as we believe would result from a denial of this application, we should not hesitate to deny this application, but we believe it to be our duty to view this application from the standpoint of all the parties in interest, and so viewing it, we are constrained to find that the certificate should be granted as prayed for."

NEW YORK—First District.

The Bronx Gas & Electric Company. By a vote of four to one, Commissioner William Hayward voting in the negative, the First District Commission granted the application of the Bronx Gas & Electric Company for authority to repay to its treasury $16,880.05, previously expended upon the improvement of its plant, and to withdraw this amount from the proceeds of the sale of $200,000 in bonds previously authorized by the Commission. As the company prior to 1909, when the Uniform System of Accounts prescribed by the Commission went into effect, had not kept its books in sufficient detail to afford definite information as to the cost of its property, the Commission made an appraisal, which fixed the reproduction cost, less depreciation, at $998,860.53. On the recommendation of Commissioner Robert C. Wood, who held the hearings on the application, this amount was fixed as the value of the company's plant on December 31, 1908. This total, however, included an allowance of $160,243.71 for overhead charges and incidentals. Commissioner Hayward objected to the extent of this allowance, and in a minority opinion argued for a smaller amount. The majority of the Commission adopted Commissioner Wood's recommendations as above.

Second District.

"Jitney Bus" Law. Supreme Court Justice Hasbrouck has filed an order upholding the "Jitney Bus" law in all its principal phases. Among the classes of vehicles which must secure the consent of the local authorities and a certificate of public convenience and necessity from the Commission, are those carrying passengers in competition with another common carrier, which is required by law to obtain the consent of the local authorities before beginning operation.

OREGON.

Pacific Telephone & Telegraph Company. After an investigation on its own motion, the Commission has issued an order prescribing rules and regulations pertaining to deposits, termination of contracts, advance payments and short-term contracts. The advance deposit of five dollars required by the company for flat-rate service is abolished, and this class of service may be obtained by the payment in advance for a period not to exceed that for which bills are regularly rendered (present practice, one month). The company may discontinue flat-rate service for failure to pay in the manner prescribed or for any other incidental telephone charges due from the customer, because of the installation of such service. In any case, service is not to be disconnected until fifteen days after written notice to the subscriber. A subscriber making application for metered or measured exchange service may, where prepayment collection devices are not used, establish his credit in the following manner: (1) Where he owns the premises to be served. (2) Makes a cash deposit. (3) Furnishes a guarantor for the payment of his bills. (4) Has paid all his bills to the telephone utility promptly during the twelve months prior to the effective date of the order.

In an applicant for metered or measured service makes a cash deposit to insure payment, the amount shall not exceed $2.50 for domestic or residence, metered or measured exchange service, and $5.00 for business or commercial metered or measured exchange service. The order also provides that the utility may apply the deposit in the case of metered or measured service, where the applicant fails to pay his bills, or so requests them to do.

PENNSYLVANIA.

Abington Electric Company. Upon the complaint of C. A. Lisk vs. the

Abington Electric Company, the Commission has held that a public service company has no right to adopt a policy of serving only such customers as are remunerative at the time of installation of facilities, providing the requests for service are reasonable.

WISCONSIN.

Grange Hall Farmers' Telephone Company. The order of the Commission, refusing to authorize the Grange Hall Farmers' Telephone Company to furnish service in competition with the Highland Telephone Company was abstracted in ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, August 21, 1914, p. 379. To review the situation briefly, the Grange Hall Company had been granted a certificate by the Commission to build a certain line, but it subsequently appeared that no notice had been given the Highland Company of the proposed extension, although the latter company was furnishing service along the route in question. The Commission ordered the construction of the line suspended, pending a formal hearing of the matter. The line was, however, rushed to completion, and after a finding that the duplication of service was unnecessary and not in any way desirable, the Commission's order required the abandonment of the line.

The matter was again brought before the Commission by complaint of the Highland Company that this order has not been complied with.

The Commission finds, however, that the intruding company, acting as an entity distinct from the patrons of the line, has discontinued service, but that the patrons continue to use the equipment installed as a neighborhood convenience. These patrons again urged their desire to continue the service, under the belief that they could furnish service at $3.00 per subscriber per year after an initial cost of $390 for 5.5 miles of line. The Highland Company charges $12 per year for rural service over metallic lines. The Commission says: "It is unfair to attempt any comparison between the rate charged by a company furnishing telephone service upon a commercial basis, and including presumably a reasonable allowance for interest on capital invested and for depreciation of the property, and the minimum annual cash disbursement at which farmers can secure grounded line telephone service with an excessive number of subscribers on the line and with no allowance made for depreciation or interest or for the labor required to keep up the line. * * * Just what character of service would be considered adequate by these subscribers is not fully determined. It may be said generally that what constitutes adequate service seems to depend very materially upon who is furnishing the service. Where it is being furnished on a commercial basis patrons are seldom slow to point out the shortcomings of telephone service over cheaply constructed grounded lines with the number of subscribers on a line not properly limited. Where, however, the service is furnished on a cooperative basis, patrons will often accept a very much lower standard of service than they would be willing to accept from a commercial company. We assume in this case that by adequate service the witnesses mean not merely service which will remain acceptable while the experience of having a telephone in the house remains a novelty, but such service as is usually demanded by persons accustomed to having telephone service, and who are acquainted with the standards at which such service may be maintained." * * *

The Commission points out a number of omissions in the estimate of costs the parties have in mind, and quotes from a letter from an association which made a failure of a similar undertaking.

"It may be argued that the patrons to be served should be permitted to furnish themselves with as poor service as they care to put up with. But the Highland Telephone Company, it must be remembered, already had a line in this territory, apparently capable of furnishing good service and supposedly put there in response to a demand, either direct or indirect, for such a grade of service. It is, therefore, entitled to protection against the competition of a line built as an experiment, to give service to a minority.

"If there were not telephone service being furnished in the territory the projectors of a new line might well consider, as a matter of policy, whether they could afford to pay a telephone company a rate sufficient to meet all the expenses incurred in furnishing telephone service or whether it would be better to pay a telephone company for only such portion of the service as each individual would be incapable of furnishing for himself. After a company has been induced to enter into the territory to give service it is too late to consider this preliminary problem." * * *

The parties now using the service are given one month in which to make other arrangements for telephone service. "Unless all connection between this line and the telephone instruments on the premises of subscribers are discontinued within one month from the date of this decision, the matter will be certified to the Attorney General for prosecution."

Bridgeport Toll Bridge Company. The Commission made a valuation of the property of the bridge company in order to determine the reasonableness of the toll exacted for the various classes of traffic. It appears that the present owner purchased the bridge in a badly deteriorated condition, and the question arose as to whether or not a utility is entitled to a return upon the cost new of such property "for which the present owners could not have paid an amount approximating the Commission's present value, if reasonable business judgment were exercised."

The Commission says: "The statement that 'The primary basis of any calculation as to the value * * * must be the money *actually invested* by the owners cannot, it is believed, be interpreted to mean that when a man purchases a property, which, due to peculiar circumstances, is in a precarious situation, for an amount which is only about one-quarter its appraised value, that he shall be limited to a return upon only the money actually paid by him for the property and not upon a reasonable present or depreciated value.

"The figures of the tentative valuation, as compiled by the Commission, have been carefully analyzed and checked on a thoroughly balanced basis, and there seems to be no question that the fair value of the property is at least as great as its present physical value. Nor can the fact that the present owners paid but very little for the property when the same was purchased in any manner compel a lower valuation under the provisions of the law. All the property used and useful for the convenience of the public must be valued by the Commission. The law says nothing about deducting the value of property owned by the company, but which originally cost it little or nothing. This Commission has previously discussed this point in a number of decisions, excerpts from which follow:

"'For the purposes contemplated here, the Public Utilities law does not inquire into the manner in which property of utility corporations devoted to the public use was originally obtained, whether by purchase * * * or gift * * * The law simply compels the Commission to value this property and to consider this valuation in taking official action with respect to rates and service.' Tighe et al. vs. Clinton Tel. Co. 1908, 3 W. R. C. R. 117-126.

"'As the cost of reproduction of a plant usually plays perhaps the most important part in determining its value, it is more than likely that the owners would have to bear losses in case land and other property had depreciated instead of appreciated. It would seem only just that the rule should work both ways.'"

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 310.—Cleaning Commutators.—I would like to know of something which may be safely used around motors and dynamos for cleaning gummy commutators, etc. We have been using gasoline, but have had trouble from sparks from the brushes igniting the gasoline.—A. S. N., Plymouth, Mass.

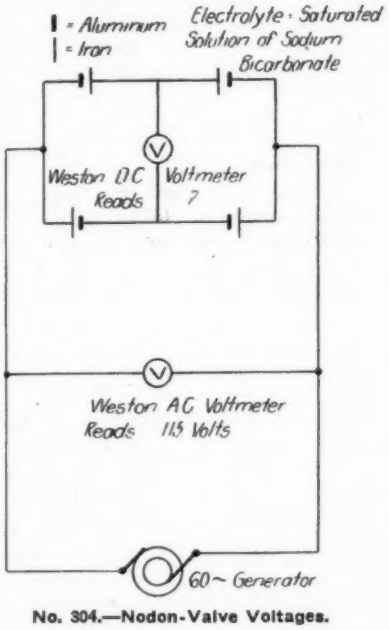
No. 311.—Simple Rate System.—Has any system of rates for residence customers of a central station ever been devised which, though based on actual or assumed maximum demand and including primary and secondary rates for, say, 30 hours' use of this demand, can be fully explained to any customer without using the words "30 hours' use," "demand," "maximum demand," or even "kilowatt-hours"? If such a simple system is as yet too ideal, what is the nearest approach thereto that has been attained?—W. H. T., Ann Arbor, Mich.

No. 312.—Connection of Bell-Ringing Transformer.—Recently I was called to correct some trouble in a door bell rung from a bell-ringing transformer. I found that the push-button was arranged to close the primary circuit of the transformer, the secondary being connected directly to the bell. The contacts of the push were burned from arcing, which did no further damage because it was in a non-combustible case. It was explained that this connection had been insisted on to save the small current that the transformer would take continuously. Is there any provision in electrical construction rules to prohibit this connection?—E. S., Atlanta, Ga.

Answers.

No. 304.—Voltages With Electrolytic Rectifier.—In the diagram given of a Nodon valve (electrolytic rectifier) I find by actual test that the direct-current voltmeter reads higher than the alternating-current voltmeter. Theoretically, as I reason it, the alternating-current voltmeter should read approximately 0.7 of the maximum ordinate of the sine curve of E. M. F. and the direct-current voltmeter should read approximately 0.6 of the maximum ordinate of the same sine curve of E. M. F. Please explain why the direct-current voltmeter reads higher than the alternating-current voltmeter. To give a concrete example, suppose the alternating-current voltage applied to a Nodon valve, as shown in the diagram, be 115 volts, what will the rectified direct-current voltage be?—A. G., Fort Monroe, Va.

The actual values of voltage obtained will differ with the different means employed for obtaining them, namely whether a thermic, d'Arsonval or other type of instrument is used. The rectified voltage also depends to a certain extent upon the electrolyte, its composition and temperature, and the current flowing. Theoretically, a single cell, when measured with a direct-current voltmeter, which measures average values, will give a reading which is equal to the alternating-current voltmeter reading divided by 2.22, since the alternating-current instrument indicates the square-root-of-the-mean-square values. If alternating-current instruments be used in both the alternating-current and the rectified-current circuits


= Aluminum
= Iron
Electrolyte - Saturated Solution of Sodium Bicarbonate
Weston DC Voltmeter Reads 7
Weston AC Voltmeter Reads 115 Volts
60~ Generator

No. 304.—Nodon-Valve Voltages.

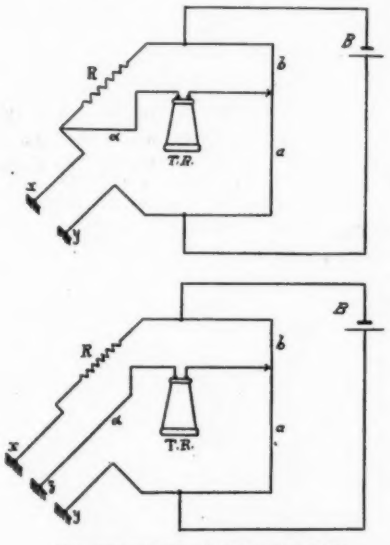
the voltage of the latter will be found to have a value equal to half that of the former or supply circuit. In practice the theoretical voltages do not exactly materialize because of leakage, capacity effects, as well as for reasons already given.

The arrangement of four valves or cells shown in the sketch is used in order that both half cycles of the alternating current may be utilized. With this arrangement each half cycle traverses two valves connected in series, and the two successive half cycles are rectified in one direction, adding their effects in the voltmeter circuit. With such an arrangement inductance is usually inserted in the alternating-current leads, as it assists regulation, reduces the pulsation of current and improves the wave form of the rectified current.

At the time of starting such an outfit as is shown in the sketch with an impressed voltage of 115 volts the rectified voltage may be as high as 96 with a new valve. It will soon drop, however, to probably 80 or 82 volts, where it will remain. The causes of the drop in voltage are, the resistance at the opening of the valves by the film upon the anode, resistance due to the film at the cathode, effects of static charge at the opening and closing, and because the composition of the anode is not uniform.

Querist states that he uses sodium bicarbonate as the electrolyte. Probably better results, longer life, less coating of the plates, etc., will result by using a neutral solution of ammonium phosphate. Use distilled water. Use the pure ammonium phosphate, not the double phosphate of ammonium and sodium; if the crystal phosphate neutral solution be used it will turn alkaline because of the ammonia gas evolved when the current passes through it.—K. R., Chicago, Ill.

No. 305.—Test of Ground Plates.—



No. 305.—Test of Ground Plates.

What is the best way to test the effectiveness of ground plates?—F. A. H., Chicago, Ill.

A widely used method for determining the resistance of a ground connection is to use Kohlrausch's bridge with a telephone. The method supposes that three grounds x, y and z are available. The values $x+y$, $x+z$ and $y+z$ are determined in succession to get the equations from which the values of the three resistances can be calculated. The connections for determining the value of $x+y$ are shown in the upper diagram. When silence is obtained in the telephone we have $b(x+y)=aR$, where a and b form together the contact wire along which a contact slides. In an analogous way the values $x+z$ and $y+z$ are found. However, this method has several inconveniences and may be replaced to advantage by the following method. The value $x+y$ is determined as described above, but then the connections are changed to those of the lower

diagram. All that need be done for this purpose is to change the connection of the telephone from the ground x to the third ground z. When silence is obtained in the telephone, it is $by=a(R+x)$; whence we have two equations for the two unknown values x and y. This method is, therefore, simpler and requires less calculation than the former method. It is also more accurate.

A recent article describng a series of tests on the proper construction of earth connections by the General Electric Company and the United States Bureau of Standards gives details of methods used and conclusions drawn, in the *General Electric Review* of September, 1915. Tests were made of various forms of grounding devices, such as plates, cones, rods and pipes of various sizes. The final conclusion reached was that pipes are the most desirable form owing to the fact that they can be readily driven to a depth sufficient to reach permanent moisture, while plates or cones require considerable excavation with resulting cost. No ground of any form is effective unless placed seven feet deep or more, which fact evidences the value of a deeply driven pipe. An earth connection having a resistance of 200 ohms is valueless in protecting transformer secondary mains in the event of a leak from the primary and even a lightning arrester connected to such a ground is of doubtful value. It was finally decided that a single three-fourths-inch galvanized pipe driven ten feet into the ground would meet the requirements, except at power houses or substations, at which points a number of such pipes in multiple are to be used. The first 250 such grounds which were installed showed an average resistance of 15.68 ohms as against an average resistance of 200 ohms (approximately) in a test of 100 grounds, in scattered locations and of various ages of other forms mentioned above.—P. B. W., Verbena, Ala.

No. 307.—Special Type of Induction Motor.—A new type of induction motor has been invented in which the bars of the squirrel-cage rotor are made of special composition possessing characteristics which automatically limit the starting current. Has this construction been applied to any large motors and is it effective in operation?—C. M. D., Gary, Ind.

Numerous schemes have been developed and patented to limit the starting current in squirrel-cage motors. Most of these arrangements make use of a material with a high temperature-coefficient for the rotor bars and end rings. At the moment of starting when the current is the greatest, the bars heat up very quickly and increase their resistance to such an extent as to limit the current to a certain predetermined value. As soon as the motor speeds up the current and therefore the temperature and resistance decreases until the motor has attained its normal speed. Materials with such high temperature-coefficient are, for instance, iron, iron alloys and certain of the bronzes.

None of these schemes, however, have, to the writer's knowledge, come into extensive use owing to the inherent bad mechanical properties of the materials used. The mechanical stresses to which the bars and end rings are subjected due to the wide ranges in temperature from start to running—up to 200 degrees centigrade—have invariably led to corrosion, frequent dismemberment of bars and rings and loosening of the bars in the slots, so that reliable working after a certain number of starts has been made becomes impossible. Further, the slip in motors of this kind is always considerable, as the metal used for the squirrel cage has already a high resistance compared with copper or bronze as used in a normal motor. This means, of course, a lower efficiency as obtainable with a normal motor.

To obviate these disadvantages other means have been devised. Several patents, for instance, refer to an arrangement of two squirrel-cage windings, one of high and the other of low resistance. The winding with the high resistance is always closed and, in starting, limits the current to a certain value. The other winding is open during starting; when the motor has nearly attained its full speed this winding is automatically short-circuited and offers thus a much lower resistance to the secondary path. The motor can therefore run with a slip like an ordinary motor approximately and has also a better efficiency than the motor with one winding only. But even these arrangements are not extensively used on account of their mechanical difficulties. The most reliable way is to use a phase-wound rotor with slip rings and starting resistances, the latter being cut out according to the starting current drooping down; the regulation is effected either by hand or automatically.—H. A., Pittsburgh, Pa.

No. 308.—Aluminum Solder.—Can aluminum wire be soldered and what is the best way for doing it, if it can be done?—S. H. L., Joliet, Ill.

The difficulty in soldering aluminum is to get a flux which will dissolve the skin of aluminum oxide, always to be found on aluminum wire which has been exposed to the air, and which will not affect the aluminum underneath, and then to get an alloy which will solder. The metallurgical magazines are full of recipes for such compounds, but I have not seen one yet that works reliably. Welding with the oxy-acetylene flame is used on aluminum sheets in aluminum-ware factories, while wires are usually joined by electro-percussive welding. This was the subject of a paper by C. E. Skinner and L. W. Chubb, presented at the twenty-sixth general meeting of the American Electrochemical Society at Niagara Falls, October 12, 1914, and is briefly described as being a process in which two wires are held together by mechanical force, while a condenser discharge is passed between the ends. The heat generated is so localized, so sudden and so intense that there is no time for heat conduction through the shanks of the wire, and the ends will be melted and vaporized whether the melting point be high or low. For this reason metals of different kinds can be welded together independently of their electrical resistance, melting point or heat conductance. While all combinations which have been tried are weldable the joints in such pairs as aluminum and tin, and lead and iron are not permanent. On the other hand, certain alloys near both ends of the copper-aluminum series are brittle, while the electro-percussive weld of copper to aluminum is ductile. This joint is of great importance, as copper lead wires can thus be attached to aluminum coils. The original paper should be referred for further information.—D. M. L., Elizabeth, N. J.

Aluminum can be readily electrically welded, and, by proper treatment, electroplated. But some difficulty has heretofore been attached to soldering this metal. The high heat conductivity of the aluminum withdraws the heat ordinarily of the molten solder so rapidly that it "freezes" before it can flow sufficiently. A German solder (probably market-short at present) said to give good results, is made of 80 per cent tin to 20 per cent zinc, using a flux composed of 80 parts stearic acid, 10 parts chloride of zinc, and 10 parts chloride of tin. Pure tin, fusing at 250 degrees centigrade, has also been used as a solder. The use of chloride of silver as a flux has been patented, and used with ordinary soft solder has given some success. A pure nickel soldering bit should be used, as it does not discolor aluminum, as do copper bits. The Aluminum Company of America recommends the following practice: Aluminum can be readily tinned for soldering, say, into a switch or busbar terminal, by anyone with but little experience. First, it is necessary to keep the end of the cable hot, because of the high heat conductivity mentioned above; secondly, one must mechanically work the tin through the oxide coating on the surface of the aluminum. The first condition is provided for by using a blow torch, in the flame of which the cable is kept off and on, after the preliminary heating during the tinning process, or by pouring the tin, from a pot of melted tin, over the cable with a hand ladle. The second requirement is kept by working the tin onto the aluminum with a piece of wire, a file or a fine scratch brush.

The last is the easiest and best method, and it has been found that a jeweler's scratch brush is the most satisfactory. Cables of more than two layers of strands should have each succeeding layer cut back one-half inch to expose the ends of the strands of the layer it covers, and the ends of all strands should be tinned. For tin Richards' solder is the best, though pure block tin or the ordinary half-and-half solder can be used.—P. B. W., Verbena, Ala.

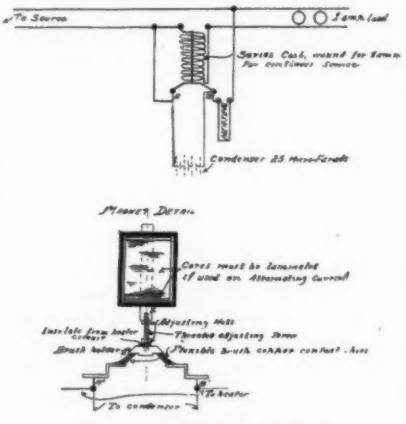
Aluminum can be soldered so that the joint will have good electrical conductivity and be mechanically strong, providing certain precautions are taken, and kept in mind at all times. The fundamental requirement is that the joint be kept hot. While copper and solder alloy at a temperature of about 240 degrees centrigrade, the alloying temperature of aluminum and solder is about 360 degrees centrigrade and the difficulty of reaching and maintaining this temperature is due to the high heat conductivity of aluminum permitting the flow of heat away from the joint. The use of a blow torch is almost always necessary for heating, and it usually proves quite satisfactory. A further difficulty in soldering aluminum is that, as with other metals, a film of oxide forms on the surface of the heated metal when it is exposed to the atmosphere. This film of oxide must be removed, otherwise the solder cannot make intimate and actual contact with the aluminum. With other metals this removal is accomplished by means of salts and fluxes, but no flux has as yet been discovered that is entirely satisfactory with aluminum, so resort is had to mechanically scraping the surface while maintaining a high temperature. The best way to clean the surface is to scrape with a hard brass scratch brush at the same time following with solder and scratching it in, as it were. This must be kept up until the whole surface is well "tinned." The solder should preferably be about 0.5 by 0.5 inch square, this size having been found in practice to be the most convenient for holding the heat and covering a wide surface at the same time.

The choice of solder plays quite a large part in soldering aluminum successfully. A solder having a high percentage of tin and zinc has been found the most suitable, although the ordinary half-and-half can be used, if no other is available. A solder composed of 30 per cent pure zinc, 35 per cent pure tin and 35 per cent phosphor-tin makes a good solder.

To obtain good results, and they may be obtained, remember to keep the joint really hot, tin thoroughly, and use the proper kind of solder.—K. R. Chicago, Ill.

Soldering aluminum and its alloys was for some time a difficulty, but the Alliance Aluminum Company now supplies a solder which works perfectly if the instructions furnished with it are followed. As it is often necessary to solder while repairing or erecting, this method makes it ideal for the workman. Aluminum can also be welded electrically; this makes a good joint, but as it is not as convenient as soldering, especially when out on repair jobs, the soldering method as supplied above will undoubtedly solve the problem.—W. T. E., Ansonia, Conn.

No. 309.—Automatic Cutout.—It is desired to keep an electric water heater taking 550 watts in circuit as continuously as possible. A few other devices and lamps are also on this circuit, but are turned on for short intervals only. Is it possible to devise some automatic means for temporarily cutting out the heater while the other load exceeds one ampere? The device must reconnect the heater as soon as the other load is cut off or reduced to less than one ampere.—V. B., Milwaukee, Wis.



No. 309.—Automatic Cutout.

The automatic making and breaking of that part of the circuit supplying the heater, which is to be accomplished independently of the other portion, can be best attained by means of a series magnet arranged and connected as in the accompanying diagram. The magnet should be wound to actuate on one ampere; specifications should state that this is to be in circuit continuously in order that undue heating of same may not occur, with consequent loss of energy. A circuit in parallel with the winding should be established after the plunger has reached the "up" position. This circuit should be of such resistance as to cut down the current in the magnet without sufficiently weakening same to allow plunger to drop.

If the supply is alternating current, it will be necessary to build the cores of laminated iron, otherwise local or eddy currents will be formed. In any case the plunger should be insulated from the local heater circuit. Means of regulating the break distance are obtained by the adjustment of the nuts on the threaded stud tapped in the plunger core, and insulating washer on the brush holder, as shown. The contacts, consisting of flexible leaves of copper, cause a brushing or wiping action on the studs, thereby tending to keep them clean.

If the voltage employed is relatively high, as 600 volts direct current, there will be a tendency to arc on the breaking of the 550-watt heater circuit. This can be reduced to a negligible quantity by inserting a small condenser of not greater capacity than 25 microfarads, across the points *A B*, as shown.

The writer has several magnets of this character operating on 125 and 250-volt direct-current circuits. In the latter case conditions are such that the auxiliary circuit, corresponding to the heater circuit, has to make and break over periods of considerable length, as often as several times each second. No condensers are used and arcing is not experienced by virtue of the brushing contact used.—M. K., Passaic, N. J.

Westinghouse Company Establishes Savings Fund for Employees.

In order to encourage the spirit of thrift among its employees the Westinghouse Electric & Manufacturing Company has just established a savings fund which offers facilities to the employees for the handling of their savings accounts. This fund is open to any employee of the company wherever he may be located, and he may become a depositor at any time and discontinue at any time. The amount of the deposit cannot be less than 10 cents and may be any multiple thereof and the deposits must be made from each regular pay. The deposit, however, is limited to one account, the amount of which in any one year cannot exceed $500. The idea of this is that the plan is intended as a method of encouraging the employee to save his earnings and when he has been successful up to this point, allow him to handle his own finances.

Interest is paid on the deposit at the rate of four and one-half per cent and is credited semi-annually. An interesting feature of the fund is that the Westinghouse Electric & Manufacturing Company acts as a trustee and guarantees the deposits and interest.

The rules provide that an amount of $100 or less may be withdrawn without notice, but an interval of two weeks must elapse before subsequent withdrawal can be made, and for withdrawals more than $100, notice of one week must be given.

An auditing committee not to exceed seven persons is to be elected by the depositors from among their own number.

ELECTRICAL PAPERS AT MANCHESTER MEETING OF BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

By Our Special Correspondent.

The eighty-fifth annual meeting of the British Association for the Advancement of Science held in Manchester, England, from September 7 to 11, was shorn of many of its usually attractive influences and features owing to the war, and an attendance of 1,400, as compared with 2,600 at the Birmingham meeting two years ago, is therefore to be regarded as quite as large a number as could be expected under the circumstances.

The proceedings of those sections of the Association which were able to deal specially with subjects and problems created by the war—economical, educational and agricultural—naturally have attracted most notice, but papers read in the other sections have been quite up to the average in the importance of the subjects dealt with. The program of the papers presented for discussion in Section G, Engineering, is given below, and of these the papers marked with an asterisk have been abstracted in the accompanying report:

*Presidential Address, by H. S. Hele-Shaw.

"Experimental Investigations of the Thermal Efficiency of a Gas Engine," by G. Asakawa and J. E. Petavel.

Report of Committee on Gaseous Explosions.

"The Apparent Specific Heats in Gaseous Explosions," by W. M. Thornton.

"The Work of the Mechanical Engineer Department of the Municipal School of Technology, Manchester," by A. B. Field.

"A Machine for Determining Fatigue Limits Calorimetrically," by C. E. Stromeyer.

"The Manchester Drainage Scheme," by de Courcey Meade.

*"The Manchester Electrical Undertaking and the Projected Barton Station," by S. L. Pearce.

"Recent Work in the Manchester Gas Department," J. G. Newbigging.

"A Unit Gas Producer for Steam Boilers," by E. C. Mills.

*"The Heating of Iron when Magnetized at Very High Frequencies," by N. W. McLaughlin.

*"A Self-Adjusting Commutating Device," by Miles Walker.

"Electric Oscillations in Coupled Circuits—A Class of Particular Cases," by W. Eccles and A. J. Makower.

*"The Capacity of Aerials of the Umbrella Type," by G. W. O. Howe.

*"A Note on Earth Resistance," by E. W. Marchant.

*"Transformer Core Loss," by H. M. Lacey and C. H. Stubbings.

*"Exposure Tests on Some Metals and Alloys," by Ernest Wilson.

"Recent Improvements in the Traction of Vehicles," by T. H. Brigg.

Report of Committee on Complex Stress Distribution.

"The Strength of Iron, Steel, and Cast-Iron Struts," by Andrew Robertson.

"The Calculation of Torsion Stresses in Framed Structures and Thin-Walled Prisms," by Cyril Batho.

"Some Experiments to Determine Whether There Exists Mutual Induction Between Masses," by Miles Walker.

"An Investigation of the Thermal Conductivity of Thin Air Films Enclosed Between Parallel Metal Plates," by A. A. Griffith.

Presidential Address.

The presidential address of Dr. Hele-Shaw, delivered on September 8, discussed the position created by the war in the engineering industries, and the following extracts from his address show that his remarks were as applicable to the United States as to the English conditions. After quoting from a manifesto by German professors as to the part Germany expected to play in the world of industry after the war, Dr. Hele-Shaw went on to say:

"It does not, however, want such published evidence to convince any practical person of the folly of thinking that a keen and virile nation having more than 100 million inhabitants is going to be crushed out of fierce and vengeful competition, whatever the end of the war may be. We shall better appreciate what this competition will mean if we consider the marvellous progress made by Germany during the last half-century in the arts and manufactures.

"Now, when we look closely into the causes of Germany's great advance, we can learn lessons which we have been culpably slow to take to heart. Although there are other causes, first and foremost, and overshadowing all others, is the determined and whole-hearted organization of German industry.

"Germany's power in war is admitted to be her mechanical organization, and the organization of every material and engineering force to that end. Just as striking, if not more so, is her organization for the arts of peace, and I lately heard a very shrewd man of affairs express his amazement at Germany's entrance into war, when by peacefully pursuing the way she was going she would have dominated the world commercially in a few years' time, and, in the words of the speaker, might in many manufactures have made us practically bankrupt. It is undoubtedly in the matter of scientific organization, even more than the organization science, that Germany has achieved such wonderful results, and it is, therefore, in this direction that we must leave no stone unturned, if we wish to have any chance of holding our own in the future."

Dr. Shaw then indicated the directions in which he considered useful work might be done at the present time, in preparing for the era of keen industrial competition, which will follow the conclusion of war. The proposals were discussed under the following heads: Education, research, standardization and the metric and decimal system of measurements, exhibition and museums, organization.

Proposed Manchester Generating Station.

On September 9, S. L. Pearce, the chief engineer of the Manchester Electrical Undertaking, read a paper on the development of the supply in that industrial center, and describing the proposed new generating station on Barton Moss, about five miles from the center of the city. The ultimate capacity of this new station will be 160,000 kilowatts and the first section of the plant will be of 30,000 kilowatts. It is proposed to erect it in four sections, each of which will contain two complete steam-raising, electrical generating and auxiliary plants, thus providing eight complete plants in the station. This allows of one spare plant, one set aside for repairs, and six plants in commission. As proposed, the first four generating units will be turbine sets of 15,000 kilowatts each, and the remaining four, similar sets of 25,000 kilowatts each.

The arrangement includes four boiler houses, each with two batteries of water-tube boilers facing onto a central firing floor, i. e., one battery of boilers for each turbine set, and four large coal storage bins practically forming extensions of the boiler houses, but separated from the latter by a canal dock for the reception of water-borne coal. Preliminary estimates show that 500,000 tons of coal per annum will be required by the complete plant, and the canal can handle at least 1,000 tons a day, while over the Trafford Park railways 300 tons of coal an hour can be handled, sidings being provided for its reception. The coal bins will hold a two-months' supply of fuel; each bin will be equipped with two endless-bucket-type conveyors into which rail-borne coal can be fed through hoppers below track level, situated at one end of the bin, while water-borne coal received on the dock will be fed into hoppers at the other end. For this

purpose the dock between the boiler house and bins, which will be roofed in, will be provided with a traveling crane with a bucket or grab for removing coal from the barges. Each bin conveyor will run across the dock and empty into an elevated coal hopper at the end of the adjacent boiler house, returning through a tunnel under the dock and bins. The elevated coal hopper in turn will feed two endless bucket conveyors situated (both lead and return) over the bunkers in the adjacent boiler house, which are designed to carry 36 hours' fuel supply. The suction system is proposed for the removal of the ashes and soot, the pipe systems leading to receivers on the canal-dock side, which will discharge into barges, and to other receivers at the end of the coal bins, which discharge into railway trucks, soot and ashes being kept separate.

For the first section of the station there will be installed eight water-tube boilers, each with a normal rating of 50,000 pounds steam per hour and a maximum rating of 60,000 pounds and complete with its own superheater, economizer, induced-draft plant and chimney—the Prat system being proposed in regard to the latter. The first section of the generating plant will consist of two 15,000-kilowatt turbo-alternators generating, with a speed of 1,500 revolutions per minute, three-phase current at 6,600 volts, 50 cycles, and developing their normal output at 0.85 power-factor.

Steam consumptions in the neighborhood of 11 pounds of steam per kilowatt-hour at full load are anticipated, or its equivalent, viz., 7.5 pounds of steam per indicated-horsepower-hour. Cool air for ventilating the generators will be drawn in from outside the building, and passed through air filters on the way to the machines. The bulk of the steam and water pipework, whilst being kept under floors, which will add to the general appearance of the station, is nevertheless readily accessible. Considerable attention has been given to the question of the various levels so as to facilitate ease of operation.

An unusual feature of the design, at any rate in the United Kingdom, is the pump hall. Herein will be installed two steam driven and one electrically driven boiler-feed pumps, each with a rated capacity of 25,000 gallons per minute, for each complete boiler house. The upper part of the bay will contain hot-well and reserve feed-water tanks. Beneath the floor of the pump hall the main steam header, the condensing-water culverts, and the weigh bridges for testing the steam consumption of the turbines will be accommodated. In addition, from the floor of this hall the various sectional valves controlling the steam and water supplies will be operated.

Another feature of the station will be a very complete installation of indicating and recording instruments, such as are necessary to record steam and water pressures and temperatures, temperatures of electrical generators, transformers, oil switches, etc., temperatures of stored coal, and temperatures of inlet and outlet cooling air. Electrical output being largely a question of permissible temperature rise, considerable importance is attached to the installation of the above.

The station drawings show four circulating-water inlet culverts below basement level, and adjacent to them four corresponding outlet culverts. These will be connected to the Davyhulme sewage works. It is proposed to erect a pumping station here, equipped with electrically driven high-lift pumps, together with a local substation for controlling the general supply to the sewage works. The purified effluent at these works will be drawn from a large storage reservoir, which will also fulfill the function of a settling-tank, and from which the effluent will be pumped up to the generating station, where it will pass through a specially designed valve chamber before entering the condensers. The discharge to the sewage works for final treatment will take place at a substantially higher level than the intake and, owing to this increased head, the capacity of the sewage works can be greatly increased. Moreover, the discharge effluent will gain some 15 degrees temperature in passing through the condensers, which will result in important economies in the subsequent purification processes.

The main cables from the generators will run direct to their step-up transformers, two three-phase 7,500-kilowatt sets in parallel, for raising the transmission pressure to 33,000 volts. These transformers and the necessary high-tension switch gear will be housed in a separate fireproof switch house, the switchgear, of the oil-immersed and the remote-control type, will be operated from a control gallery communicating with the engine room.

The estimated capital outlay is $53 per kilowatt, but this includes the cost of 1,400 yards of culverts to obtain water for condenser purposes. The estimated operating cost, with coal at $2.16 per ton, is 0.45 cent per unit, inclusive of interest on capital.

September 10 was devoted to the reading and discussion of numerous papers of more theoretical interest to electrical engineers and short abstracts of these are presented below.

Heating of Iron When Magnetized at High Frequencies.

This paper by N. W. McLachlan described experiments illustrating the heat produced when iron is magnetized by very high-frequency alternating currents. The magnetizing current is obtained by using a Poulsen-arc generator connected across the town mains (240 volts). In order to demonstrate the extent of the losses, a magnetic heater or boiler, consisting of a solenoid wound on a glass tube containing water, and a number of iron strips or wires, is inserted in the shunt circuit of the generator. A short time after the shunt circuit is closed, the water begins to boil.

An experiment was also arranged to show the variation in permeability of iron with variation in temperature. A ring of Lohys (mild) steel is insulated with asbestos, and is wound with a number of turns of copper wire. This is connected in the shunt circuit of the generator. By passing a large current through the winding of the ring, thereby obtaining a strong magnetizing force, the magnetization losses are such that a rapid rise in temperature is produced, causing the iron to attain a bright red heat. The variation in permeability corresponding to the rise in temperature may be followed by observing the current in the shunt circuit and the voltage across the terminals of the ring. Data, including the watts lost per kilogram, are given which enable the changes to be followed.

Capacity of Aerials of the Umbrella Type.

In a paper read before the British Association at Sydney last year, Professor Howe developed a method of calculating the capacity of radiotelegraphic antennas. In addition to describing the method in general, curves and formulas were given so that the capacity of aerials of standard types could be determined in a few minutes. The umbrella type, however, was not specially considered, and it has since been suggested to the author that the usefulness of the paper would be considerably increased if curves and formulas could be given for aerials of this type. The method is briefly as follows: The whole aerial is assumed to have a uniformly distributed charge, and the average potential of the whole aerial, under this fictitious condition, is then calculated. It is assumed that if the total charge, while remaining unchanged in quantity, be allowed to have its own natural distribution, it will assume a uniform potential approximately equal to this fictitious average potential. The proximity of the earth is taken into account by the method of images. Tables and curves are given for aerials with from two to six ribs, and for various angles between the ribs and the vertical. With these curves, and those given in the

original paper, each of the nine component potentials of any given aerial of the umbrella type can be read off and the resultant average potential determined. The method is then applied to two practical examples, one a simple aerial with six single-wire ribs, and the other a more complicated case in which each of the five ribs consists of a four-wire cage, the size of the wire being different from that used for the central vertical wire.

Tests on actual aerials have shown that the values of the capacity as calculated by the author's method, agree with the measured values, within the errors of observation and of estimation, as to the allowance to be made for connecting wires, etc.

Earth Resistance.

This paper by Professor Marchant described a new method of expressing the effectiveness of earthing arrangements, such as are employed for lightning conductors, radiotelegraphic stations, and in connection with many electric power distributing systems. The method consists in determining the length of the column of earthly material which, with a cross-section equal to the surface of the earth plates, would have the same resistance as the actual "earth" or "ground." For a hemisphere imbedded with its flat surface level with the surface of the ground, this "equivalent length of earth" is easily seen to be equal to the radius of the hemisphere. Some tests were described, made by the author at Liverpool on three earths or grounds of different types, one being the water-pipe system of the building.

Transformer Core Loss as Affected by Triple Harmonics.

This paper by H. M. Lacey and C. H. Stubbings described experiments conducted in the Siemens Electrical Engineering Laboratory, King's College, London. The object of these experiments was to investigate the effect of triple harmonics upon the core losses in transformers. An alternator giving approximately a sine wave was three-phase star-connected to a three-phase choke coil. The star centers were also connected through a switch. Current-measuring resistances were inserted in the neutral and one of the outer leads. Voltmeters and ammeters were also inserted as required.

Two experiments were made, (1) with the switch in the neutral wire open, and (2) with the switch in the neutral wire closed. In each case the wave-forms of phase amperes, phase volts, and in the second case amperes in the neutral wire, were taken by means of a Kelvin quadrant electrometer and a contact-maker. It was found upon analyzing the various wave-forms that in the first case there was a 48.9-per-cent triple harmonic in the volt curve, but practically none in the current curve. In the second case, there was practically no triple harmonic in the volt curve, but 48.2 per cent in the current curve; also the wave of current in the neutral wire was very nearly a sine wave of triple frequency and having an amplitude of approximately three times that of the triple harmonic in the current curve. This shows that the existence of a neutral connection enables a triple harmonic to exist in the current curve, and also that the suppression of this harmonic from the current curve forces it into the volt curve. Using these curves, the indication curves for the two cases were drawn, and from these the hysteresis loops (including eddy-current losses) were obtained. The areas of the two loops were measured, and the ratio of the areas of case 1 to case 2 was found to be 0.775, thus showing that by insulating the star centers, a saving of 22.5 per cent in the core loss is obtained, the voltages being equal.

The watts supplied in the first case were 24.3 per cent less than in the second case, the average watts being found from the curves. The results of these experiments indicate that from the point of view of core losses the star centers in three-phase systems should be insulated.

Exposure Tests of Light Aluminum Alloys.

The physical properties of certain light aluminum alloys have formed the subject of reports during the last 14 years. In order to investigate the influence of exposure to London atmosphere, Professor Wilson placed a specimen of each alloy on the roof of King's College, London. All the specimens were in the form of wire 0.126 inch in diameter.

Commercial Aluminum.—A specimen has steadily increased its electrical resistance to 17.2 per cent in 13 years.

Copper-Aluminum.—It has already been pointed out that the electrical resistance of the copper series, in a given time, increases with the percentage of copper. One specimen containing 2.61 per cent of copper had so far corroded in 1911 that it broke quite easily. Another specimen containing 1.86 per cent of copper has now so far corroded, as to become practically useless as an electrical conductor. The tests emphasize the opinion already expressed that alloying commercial aluminum with copper, except in small quantity, is not to be recommended.

Copper-Manganese-Aluminum.—Three alloys containing from 0.02 to 0.09 per cent copper and 0.05 to 1.78 per cent manganese have steadily increased their electrical resistance to about 10 per cent in 14 years. The specimen with the highest percentage has a breaking load of 35,000 pounds and is apparently in good condition.

Copper-Nickel-Aluminum.—A specimen containing 1.08 per cent copper and 1.29 per cent nickel has somewhat diminished its electrical resistance, the percentage being now 12.4 as against 19.4 in 1908. Its breaking load was 45,900 pounds before exposure.

Copper-Zinc-Nickel-Aluminum.—One specimen containing 0.11 copper, 1.77 zinc, 2.01 nickel has changed its electrical resistance as shown by the following figures:

Year	1901	1903	1904	1908	1911	1913	1915
Resistance..	962	995	1,013	1,285	1,125	1,102	1,102

Copper-Manganese-Magnesium-Aluminum.—The alloy known as "Duralamin" is stated to contain about 0.5 per cent magnesium, 3.5 to 5.5 per cent copper, and 0.5 to 0.8 per cent manganese. A breaking load as high as 90,000 pounds can be obtained, according to treatment. The specimen exposed has steadily increased its resistance to 9.6 per cent in four years. It is, however, so brittle, that a small loop cannot be bent without fracture.

The author was unfortunately unable to report on the copper specimen, as it had been stolen from the roof.

Self-Adjusting Commutating Device.

It is well known that a direct-current generator fitted with commutating poles (sometimes called interpoles) will not commutate very heavy overloads, owing to the magnetic saturation which occurs in the iron of the interpole. When the excitation becomes very great the saturation of the iron interferes with the proportionality that should exist between the current to be commutated and the commutating flux.

The paper by Professor Walker describes a device tried at the Manchester School of Technology which automatically produces the right amount of commutating flux over very wide ranges of load. So effective is the correcting influence, even where the diverter in parallel with the commutating-pole winding is deliberately put out of adjustment that, whether it be short-circuited or given a resistance equal to five times the proper resistance, the flux will be preserved at approximately the correct value.

A 500-kilowatt 500-volt rotary converter, built by the British Westinghouse Company was fitted with the double-brush gear, and it was found that with 3,000 amperes flowing the commutation was sparkless. The device is being at present installed on a 1,500-kilowatt rotary converter, on which the commutating conditions would otherwise be rather difficult.

Cadmium-Vapor Arc Lamp.

At one of the other Section meetings H. J. S. Sand exhibited a cadmium-vapor arc lamp, the use of which he

recommended for polarimetric and other purposes. It is comparable in general principle with the mercury-vapor lamp. The lamp is constructed of quartz glass and the cadmium is freed from oxide and dissolved gas by a process of filtration while at the pump. It is hindered from adhering to the glass by the presence of a small amount of a loose powder (zirconia) in the lamp. The metal is melted by external heating before starting, and maintains itself in the molten condition by the heat of the current. Once started, said Dr. Sand, the lamp may be kept burning for an indefinite time.

Gas-Fired Boilers.

E. C. Mills discussed the several classes of gas-fired boilers and dealt more particularly with the features of the Mills furnace which comes in the class of unit bituminous gas producers delivering gases hot and unpurified direct to the boiler. He detailed the action and control of the induced draft, giving the separate air supplies for gas production and its combustion; the cellular construction of the roof and walls by which air for combustion is heated by the otherwise lost radiant heat of the producer; the special design of fire-brick gas-and-air-mixing device and burner; and other features. The results of tests on a Cornish boiler, worked on an ordinary internal fire and with the Mills producer, with the same fuel in each case, and tested by the same expert, showed a saving of about 50 per cent and there was no smoke. Tests on a Lancashire boiler with the Mills producer gave high efficiencies and standardized evaporations ranging from 10.23 to 11.47 pounds of steam from one pound of coal, and on a comparison with another boiler fired with the same fuel but with the ordinary internal fire, the tests showed a saving of about 18 per cent in evaporation, and an entire absence of smoke.

Radiotelegraphic Investigations.

An important report on radiotelegraphic investigations was submitted by the Special Committee, which, with Sir Oliver Lodge as chairman and Dr. W. H. Eccles as secretary, had been considering the subject. The effect of the war upon the investigations was naturally to place a handicap upon the efforts of the committee and those who in different parts of the world were furnishing statistical and other information. Early in August, 1914, private wireless telegraph stations throughout the British empire nearly all stopped collecting statistics, while naval and other government stations stopped all merely scientific observing The radiotelegraphic stations in Russia, Germany and neighboring countries doubtless discontinued the filling up of the committee's forms as soon as mobilization began. A few stations in India, Australia, Canada, the West Indies and the United States are, however, still at work. In the United States about thirty stations are making observations. The program of the committee for collecting statistics three days a week in all parts of the English-speaking world, and some other countries, was intended to embrace one complete round of the seasons, but the scientific value of this work is diminished by the fact of the interruption occurring after only three months. The conclusions drawn will yield information, which will guide the committee when it is able to further attack the problems concerned.

In its analysis of the records of strays the committee first referred to diurnal variations. The principal and most universal fact is that the strays heard in the dark hours are much more numerous and louder than those heard during daylight. If curves be drawn showing the amount of disturbance to telegraphic work from hour to hour, two of the curves stand out; one in which the changes from day to night and night to day conditions are somewhat abrupt, and another in which the changes are much more gradual. The former curves might be called "trough-shaped," the latter "U-shaped." The former type is met with at sea and on islands at a considerable distance from the mainland; the other on the mainland, especially in the tropics. The lowest point of the U, or of the trough usually falls a little after midday, and the highest point of the convex part of the curve occurs a little after midnight in nearly all stations north of the equator. The only exception to this rule is found in some records from Lagos, Nigeria, where the curve showing the intensity of disturbance is lowest about 7 a. m., and rises during the daylight hours. Unless local weather conditions are producing great disturbance, the change from night to day conditions and vice versa in stations north of the equator, lags behind sunrise and sunset. At some stations south of the equator, for example, Cocos Island, the opposite rule seems to be usual. These regular and universal diurnal variations have an average magnitude which is represented on the arbitrary scale used in the forms by figures like 2 in the day, and 5 at night, in tropical latitudes, or 0.3 in the day, and 3 at night, in temperate latitudes.

Occasionally the radiotelegraphic work at a station is rendered almost or quite impossible for a period, by strays of vigor and number greatly exceeding the average. These occurrences are for brevity called "X storms," the term X being an alternative designation for "stray" or "atmosphere." When an X storm happens in the day and lasts more than an hour or two it may completely alter the character of the curve of that day's disturbances, and even make the day portion of the curve higher than the night portion. An analysis of the records has shown that X storms occur within the same two or three days over very wide areas. A comparison of European, American and Canadian records has shown very plainly that periods of severe strays coincide with periods of low barometer, high wind velocity, rapid change of temperature, great rainfall and especially rapid barometer fluctuations. The worst X storm in the American records was also accompanied by the exceptionally rapid movement eastward from the Pacific of a cyclonic depression with steep pressure gradients. A report from a California station of the American Marconi Company, on this latter occasion, states that the barometer was fluctuating between 29.44 and 29.52 inches very rapidly, the variation being accompanied by gusts of wind, which attained the velocity of 70 miles per hour. The disturbance produced in the telephones by the strays amounted to a roar. Meteorological and other records lead to the conclusion that X storms are often associated with thunderstorms at places not very far distant. Sometimes all the symptoms of thunder weather, except thunder and lightning, may be present in a locality and a heavy X storm be recorded. A report received from the wireless telegraph station of the Australian government, situated at Esperance, states that during the daytime rain is preceded in at least 80 per cent of cases by intermittent disturbance. Strays of varying strengths may be heard from 6 a. m. to sunset for one or more consecutive days prior to rain. There is evidence that northwest winds on the British Atlantic coasts, especially in winter, are associated with strong strays at Irish stations and at sea. The atmospheric convection produced by land may be sufficient to account for this. R. Ricci, of the Marconi Company, reports that on two trips round the world he made especially careful daily observations, and he states that in midocean strays are, as a rule, very few and feeble, both in the day and in the night, but that when the edge of a mountainous continent is approached strong and even continuous strays are normal. In this something must depend on the direction of the prevailing wind relative to the land.

Considered as a whole, the statistics before the committee show that there appear to be two kinds of X storm occurring in the daytime: (1) Those

produced by convective conditions in the atmosphere within perhaps 100 miles of the station which may be termed local X storms. (2) Those originating at a distance. Regarding the first class, they may occur almost simultaneously over a whole continent, but this is only because convective conditions happen to be ruling all over that area. Stations not too far outside the boundary of such a region also receive many strays, but apparently their distance must be limited to within 200 miles of the disturbed regions. In general, it may be concluded that the observation of strays in the daytime constitutes a method of feeling the fringe of a region of convective weather, and so anticipating thunder and rain a day or two in advance. This ability to prophesy the advent of thunder weather is as old as wireless telegraphy itself, but hitherto it has been thought that the electric discharges at a great distance were responsible for the strays heard at the station attempting to prophesy. The present analysis indicates rather that at any rate in the daytime the strays are frequently due to very local discharges, often too weak to give noticeable lightning or thunder, but definitely indicative of an approaching period of instability in the atmosphere. The second kind of X storm is not of strictly local origin, but is sometimes traceable in the stray observations made hourly at the Malta station of the Eastern Telegraph Company and the Sierra Leone station of the African Direct Telegraph Company. There is evidence that on certain occasions the same cause is affecting both stations, though they are separated by 2,500 miles, mostly across mountain and desert. As regards disturbances observed at nighttime, these are also frequently very local and due to convective weather, but there is probably a greater proportion of non-local storms than appears in the day records. Australian stations report that the worst and most continuous type of disturbance (apart from local thunderstorms) occurs on calm nights, when the sky is blue and starry. Lieut. E. R. Macpherson reports from Sierra Leone that a very dry wind, which blows periodically for several days on the west coast of Africa, causes an almost complete cessation of strays immediately it starts, and allows of their resumption immediately it stops. On the other hand, the monsoon period on the same coast is one marked by great X storms.

Many observers have made for the committee precise observations of individual strays, by making, on lines graduated to represent time, marks corresponding to each stray as heard in the telephones, the zero of time being fixed by aid of radiotelegraphic time signals within range of the observer. Comparison of the records made in the British Isles has shown that on an average night many of the storm strays are heard by all the observers, and on days free from X storms the same remark applies. Coincidences have also been noticed between pairs of American stations not too widely separated. The analysis for very distant stations has not yet been carried out, except for a very few in Europe. For example, in June, 1914, coincidences were traced in the strays heard at Southampton and Dresden, Gibraltar and Dresden, Guildford and Malta. A proper investigation of the meteorological conditions accompanying or determining the periods when strays are heard simultaneously at places very wide apart, has not yet been made.

By the kindness of Gen. George P. Scriven, chief signal officer of the United States Army, the committee has obtained reports from officers in the wireless telegraph stations of Alaska concerning the presence or absence of any connection between auroral displays and disturbances due to natural electric waves or atmospheric discharges. At six stations special observations have been made during the later months of last winter. Various types of aurora were watched, but nearly all the observers reported that the appearance or disappearance of aurora caused no unusual disturbances. The best months for such observations in Alaska would, it is stated, be October and November. The systematic work had not then been started, but one telegraphist reports that during this period of more brilliant display the only thing noticed in the radiotelegraphic apparatus was a trifle more electrical disturbance than occurred when there was no aurora.

Radio Tower Falls at Tufts College.

A 300-foot steel tower at Tufts College, Medford, Mass., was blown down in the gale of September 26, falling across a railroad line and causing the derailment of the locomotive of an oncoming train. The embankment on either side of the track prevented the falling of the tower onto the rails, the impact of the locomotive breaking the framework and carrying it about 30 yards.

The tower had not been completed, temporary guy ropes holding the upper portion. It was erected for the American Radio & Research Company, organized to perfect inventions of Harold J. Powers. His discoveries are expected to eliminate many difficulties of long-distance wireless communication. A new type of aerial, shaped like a parasol, was to have been attached to the top, to avert the directional tendencies of stations now sending messages across the Atlantic. The tower will be rebuilt.

Edison and the Invention of the Electric Incandescent Lamp.

October 21 commemorates the thirty-sixth anniversary of the invention of the electric incandescent lamp by Thomas A. Edison. Following the example set last year this event will again be celebrated this year and it is hoped to set aside each recurring October 21 as Edison Day in honor of this important achievement. In view of the extraordinary developments of these 36 years in the electric lamp and electric lighting industries, it is interesting at this time to review some of Mr. Edison's reminiscences of the pioneer work in the latter part of 1878 and in 1879, and the stirring and exciting events during the constant striving and experiments, tempered first with anxiety and then with elation. On New Year's Eve, 1879, ten days after the first detailed newspaper account of the invention, the first public exhibition of the new electric light was given at Menlo Park, N. J., where Edison's laboratory is located, the place being illuminated with the new lamps. The detailed press account described the new lamp as "a lighted paper."

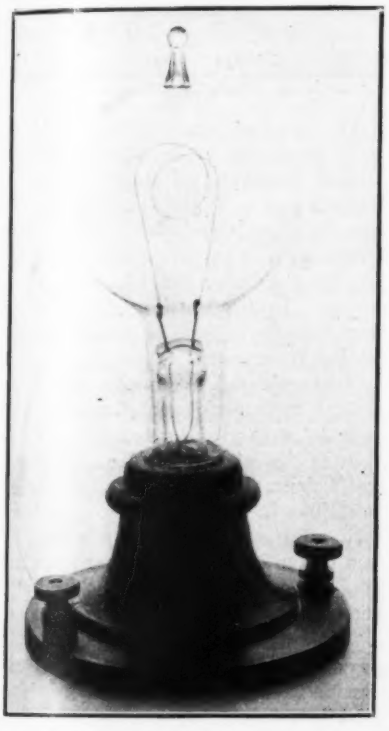
Edison practically began his experiments in electric lighting in September, 1878. Just previous to this he had returned from a visit to a Connecticut factory where an electric arc lamp was used, which concentrated his thoughts on the subject of lighting by electricity, and he determined to tackle the problem. Speaking of his entrance into the field, Edison has said, "The idea struck me all of a sudden in 1878. . . . . In those days it was easy to see what electric lighting needed—it wanted to be subdivided. The lights were too bright and too big. What we wanted was little lights and to distribute them to people's houses like gas."

The task before the young inventor involved commercially, first, the production of a pure, steady and reliable light from electricity; second, producing it so cheaply that it could compete with gas for general illumination. The electrical problems presented constituted, first, a dynamo with low-resistance armature; second, a high-resistance lamp of relatively low candlepower; third a distributing system on which the lamps would be connected in multiple instead of in series. All these ideas were revolutionary at the time.

Of the two systems before him, the arc and the incandescence, Edison wisely chose the latter as the practical one for the subdivision of electric lighting into little units. The discovery of the proper substance and method for securing the incandescence proved the sticker. The almost bound-

less scope of his investigations, which is so characteristically epitomized in his remark, "We tried various things," is evidenced in some measure by the patent records. The substances that were experimented with included electric arc-light carbon (made into paste and rolled into threads), cotton thread, vulcanized fiber, jute, palm fiber, grasses, carbonized flax, threads made of lamp black and tar, charcoal, hemp, soft paper, fish line, various combinations of paper and tar, linen, cardboard, celluloid, boxwood, cocoanut hair and shell, shavings from hickory, baywood, rosewood, and many other varieties of wood, lamp wick, punk, cork, bamboo fiber, etc.

Reminiscing on his work at that



Replica of First Incandescent Lamp.

time, Edison declares, "I think I read every patent that was ever taken out on a piece of lighting apparatus, even though it had nothing to do with electric lighting. And I think I read every book that was worth reading on illumination, before I began work in earnest. The first thing to do was to find out what was the best material to use for a light producer. I soon made up my mind that of all the material I could obtain in 1877 carbon was the most promising, if I could get the right conditions. If there was any form of carbon we did not test, I have still to learn of it. . . . . Finally, on October 21, 1879, I carbonized a piece of treated cotton sewing thread bent into a loop, and sealed it in a glass globe from which the air had been pumped out. When the current was turned on, that black thread glowed for 40 hours. That was really the first incandescent electric lamp."

Commenting on the stirring scenes in the laboratory at the time of the discovery, he says, "We sat and looked, and the lamp continued to burn, and the longer it burned the more fascinated we were. None of us could go to bed, and there was no sleep for over 40 hours. We sat and just watched it with growing elation. It couldn't be put on the market, of course, but it showed unmistakably that electricity could be used for incandescent lighting. I spent about $40,000 in bringing the investigation up to that point; and yet in a way, this was only the beginning. A little later we placed several hundred paper-filament lamps on the market. Although people liked them, I knew we could do better. So I began a hunt for the right kind of carbon. Men were sent all over the world to collect grasses and fibers that looked promising. They brought back several hundred, and out of the lot I selected a certain kind of bamboo that grows in Japan. We made filaments out of that for nine years."

Edison also did a great deal of work with metal filaments, similar to those used at present. Among the early metals experimented with considerably was platinum and several alloys. Prominent among the difficulties encountered was the liability of platinum, when that metal was tried, to melt under the intense heat of the electric current, and the tendency of carbon, when employed, gradually to become dissipated under the combined action of gases and the electric current. He tried regulating the current with the platinum filament through levers and diaphragms, but the expansion and contraction of the platinum destroyed the fine adjustment of these devices and they became worthless. Many forms of spirals of platinum and alloys were tried, also osmium-iridium, from which he obtained some success. But Edison found that when metallic conductors that fuse at high heat are exposed to a high temperature near their melting point in air for several hours by passing a current of electricity through them and then allowed to cool, the metal is found to be ruptured, and under the microscope are revealed myriads of cracks, many of which reach nearly to the center of the wire. He also discovered that they lost weight. These faults lowered their resistance and were fatal to their lasting qualities.

It seemed then that all his work so far had been futile, but success grew out of failure. This very thing induced him to attempt intercepting the deterioriating effect of atmospheric action, which resulted in the vacuum bulb. Coincident with the discovery it dawned upon him that it was necessary to employ substances with high ohmic resistance for filaments to improve the quality of the light. And so the first commercial carbon filament lamps were evolved, and later through various stages of research the other improved types up to the present modern incandescent lamps.

Edison had already been working with success on a generator to produce current for his lighting system. Commenting on the scientific criticisms of his machine when the invention was publicly announced, Edison remarked, "I was told that to get the best effects the resistance of the machine must be equal to that of its load! Did you ever hear of such foolishness?

Early Edison Dynamo.

I thought it was strange to lose one-half the energy I generated in the machine, because what we were after was to get the stuff out and sell it."

The next great problem that Edison tackled was a system of distribution. Prior to 1880 there was no method known by which large numbers of electric lights of a power about equal to a gas burner could be operated practically over large areas. Speaking of this period, Edison said, "I had the central station in mind all the time. I wanted to use 110 volts. Now there is no use for you to ask me why, because I do not know, but somehow that figure stuck in my mind; and I had calculated that if we could get the voltage up that high, the copper cost would be somewhere within sight."

In regard to installing his first central station, the old Pearl Street sta-

tion in New York City, he said, "You cannot imagine how hard it was. There was nothing that we could buy or that anybody could make for us. There were no high-speed engines, and the manufacturers said they were impossible."

Edison paved the way to original scientific investigation in the lighting field, and this work is being carried on in the research laboratories of the General Electric Company by what is probably the greatest corps of lighting experts and scientists in the world. The technical skill employed to improve constantly electric lamps and lighting embraces every phase of associated invention, design and manufacture. Practically every branch of science and engineering is represented in this great work of experimentation, testing and development. The effectiveness of such extensive investigation is best secured through co-ordinated effort. A highly developed lamp service has therefore been established.

This service, with its headquarters at the Schenectady laboratory, draws upon the entire scientific, engineering and manufacturing skill of scores of laboratories and lamp factories. It studies the materials and methods at each factory, examines their test records, makes its own check tests, gathers and compares the scientific data obtained at each laboratory, systematizes the mass of information thus obtained and presents it to the study of the experts of the laboratory staff, and then transmits the carefully sifted results to each factory entitled to the service, so as to enable each factory to embody in its product the combined manufacturing experience of the largest lamp factories and the scientific knowledge of the experts most skilled in lamps and lighting.

Edison has emphasized the value of continuous research work and given us a vision of the future in the science and art of electric lighting. "No invention is perfect," he says, "and the incandescent lamp is not an exception. Light without heat is the ideal, and that is still far off. The electric incandescent lamp of today is the cheapest form of filament that has ever been produced, but some day it will be cheaper and colder than it is. There is a good deal of truth in the saying that the firefly is the ideal. It is, so far as coldness goes. But its color is against it. You couldn't use a thousand-candle firefly to match colors, and you wouldn't want the insect to light up a street, because his light would be a hideous greenish-yellow. But some day we will get reasonably near the firefly for efficiency without copying his disagreeable color. The task needs much investigation, much research of the kind we did in 1879."

Conference on Electrical Safety Code.

The deferred conference in Washington, D. C., on the proposed National Electrical Safety Code will be held at the Bureau of Standards on October 27 and 28, 1915, in accordance with the announcement made several months ago. Official delegates have already been appointed from the following organizations: American Institute of Electrical Engineers; National Electric Light Association; American Electric Railway Association; American Railway Association; Independent Telephone Association; Association of American Railway Telegraph Superintendents; American Telephone and Telegraph Company; Western Union Telegraph Company; Postal Telegraph Company; General Electric Company; Westinghouse Electric and Manufacturing Company; National Fire Protection Association; Workmen's Compensation Service Bureau; National Safety Council; National Electrical Contractors' Association; International Brotherhood of Electrical Workers; International Association of Municipal Electricians; Western Association of Electrical Inspectors.

A considerable number of state industrial and public service commissions and municipalities will also be represented. In addition a considerable number of electrical engineers, representing the different groups of engineers with whom conferences have been held by the Bureau of Standards from time to time, will attend by special invitation. Among the places where such conferences have been held are the following: Boston, New York City, Philadelphia, Cleveland, Columbus, Chicago, St. Louis, Omaha, Denver, Los Angeles, San Francisco, Portland, Seattle, and Boise.

The Bureau of Standards will report to the conference concerning the work which has been done in the preparation of the proposed code and present the latest revised copy of the text of this code. It will also present some recommendations with regard to the method of revising the code in future and of its administration by the various states and municipalities. This will be followed by a discussion of the code and of its administration, and of the subject of electrical inspections by public authorities. All proposals in writing for amendments to the code as submitted to the conference will be referred to a special committee which will report back to the conference on the second day. After this report has been presented and discussed, it is hoped that the conference will approve the code as amended. The Bureau of Standards will recommend, however, that the code shall not be made mandatory until after its tentative use for one year, in order to give the commissions and municipal authorities, as well as the utility companies, an opportunity to become thoroughly familiar with it and to permit the experience of one year to be utilized in its further revision before being made mandatory.

A very careful revision of the proposed code has been made during the summer, and on September 1 revised copies were sent out to a large number of persons with whom the Bureau of Standards had been in conference or correspondence, and replies have been received from a number giving additional suggestions for the further improvement of the code. These latest suggestions will be used in preparing the final draft to be submitted to the conference for discussion and approval.

About 100 delegates are expected to attend the conference, and they will represent the interests which are most concerned with the code.

Transcontinental Wireless Telephony.

The successful transmission of wireless telephone messages from the United States Naval Radio Station at Arlington, Va., to the Naval Radio Station at Mare Island, Cal., a distance of 2,500 miles, was announced by Secretary of the Navy Daniels on September 29. In transmitting this information Secretary Daniels made the following statement:

"I am pleased to announce the successful outcome of experiments which have been carried on for the last few months by the American Telephone and Telegraph Company and the Western Electric Company in co-operation with radio stations under the jurisdiction of the Navy Department by which long-distance wireless telephony has been made possible.

"Today speech was successfully transmitted from the Arlington Radio Station to the Radio Station at Mare Island, Cal., and there successfully received, thus making possible conversation without wires over a distance of approximately 2,500 miles, the first time this great distance has been covered by wireless telephony. In the first experiments today the voice was successfully transmitted by radio to Mare Island from Arlington, the return answers and communication being made over the transcontinental land telephone line. This was successfully accomplished in the presence of officials and engineers of the Western Electric Company, a representative of the Signal Corps of the army, representatives of the technical and operating departments of the Navy Department, and a few other interested parties.

"After this successful demonstration, conversation originating in New York was transmitted over the land wire to Arlington, there automatically connect-

ed to the radio transmitter which carried the voice to Mare Island, where it was clearly and distinctly received, and answers and other conversation were from there transmitted over the transcontinental line to the originating office in New York.

"The conversation was carried on by the president of the American Telephone and Telegraph Company, Mr. Vail; the vice-president, Mr. Bethell, and Mr. Waterbury, one of the directors, while at Mare Island were officials of the Navy Department, John J. Carty, chief engineer of the American Telephone and Telegraph Company, and representatives of the Western Electric Company.

"Every official taking part in this demonstration is enthusiastic about the results and the possibility of developing this system as an extension of the telephone system to ships at sea. The fact that the voices can be started on a land wire and automatically transmitted to a voice radio transmitter holds out hope that persons should readily be put in touch by telephone with others at sea through some central transmitting station.

"The use of such long-distance wireless telephone communication in naval or military operations is still in an undeveloped state, but it is expected valuable use can be made of this wonderful demonstration; but aside from such considerations the department and its officials feel proud that they have been interested co-operators in the first practical development of this last march in the wonderful science of radio communication."

Later in the week announcement was made that distinct wireless telephonic communication was had with the Pearl Island Naval Station in Hawaii, 4,900 miles away.

Chief credit for the great achievement is attributed to John J. Carty, chief engineer of the American Telephone and Telegraph Company. In commenting upon this accomplishment Mr. Vail telegraphed Mr. Carty as follows:

"Carty: I want to congratulate you on yesterday's climax in the way of achievements, the greatest in intercommunication the world has ever seen. To you and the wonderful staff created by you the world owes a debt.

"To throw your voice directly without the aid of wires from Washington to Hawaii—nearly 5,000 miles—a greater distance than from New York to Paris, Berlin, Vienna or even Petrograd, and greater than that between Seattle and Tokio or Yokohama, was wonderful, but to send the recognized voice part way over wire and part through the air was still more wonderful and was the demonstration of the chiefest use that will probably attach to the wireless, as amplifying and supplementing, not substituting, the wire system, and bring into conversational communication ships, islands and places which cannot otherwise be reached.

"Your work has indeed brought us one long step nearer our ideal—a 'universal system.' Theo. N. Vail."

It is understood that the voice transmission was so clear that the operators at either end of the system of communication were able to distinguish the voice tones and recognize the characteristics of speech of the several individuals conducting the experiment.

American Institute Meetings.

The first monthly meeting of the American Institute of Electrical Engineers for the present season was scheduled to be held last night in New York City. The subject of the meeting was "Rates and Rate Making" and the author of the paper was P. M. Lincoln, a past-president of the Institute.

The next meeting of the Institute is to be held at the University of Pennsylvania, Philadelphia, on Monday, October 11. There will be sessions in the afternoon and evening and a dinner between at the Normandie. The following papers are to be presented:

"Supplemental Power for Hydroelectric Systems," by J. F. Vaughan.

"The Combined Operation of Steam and Hydraulic Power in the Pennsylvania Water and Power Company's System," by John Abbet Walls.

"Construction Elements of the Tallulah Falls Development," by Charles G. Adsit and W. P. Hammond.

A two-day meeting is to be held at St. Louis on October 19 and 20, with headquarters at the Planters Hotel. Sessions will be held on Tuesday morning and evening and on Monday morning and afternoon. The following papers will be presented:

"Municipal Co-operation in Public-Utility Management," by Philip J. Kealy.

"Automatic Control," by C. W. Place.

"Recent Results Obtained from Preservation Treatment of Telephone Poles," by F. L. Rhodes.

"The Engineering Experiment Station of the University of Illinois," by Ellery B. Paine.

"The Magnetic Properties of Some Iron Alloys Melted in Vacuo," by Trygve D. Jensen.

"The Effect of Displaced Magnetic Pulsations on the Hysteresis Loss of Sheet Steel," by L. W. Chubb and T. Spooner.

"The Unsymmetrical Hysteresis Loop," by J. D. Ball.

"Decomposing Magnetic Fields Into Their Higher Harmonics," by H. Weichsel.

"The Repulsion-Start Induction Motor," by J. L. Hamilton.

"Single-Phase Squirrel-Cage Motor With Large Slanting Torque and Phase Compensation," by Val A. Fynn.

"Calculation of the Long-Distance Transmission Lines Under Constant Alternating Voltage," by George R. Dean.

Tuesday afternoon will be devoted to an automobile trip. The St. Louis Jovians will entertain visitors at luncheon on Tuesday and the St. Louis Section, A. I. E. E., will do likewise on Wednesday.

Report on Electrolysis in Providence, R. I.

A special report on damage to water and gas pipes and telephone cables due to electrolytic conditions in Providence, R. I., has been rendered to the Commissioner of Public Works by Public Service Engineer Brunet.

The report shows that, in addition to pipes and cables, service pipes and water meters have been affected seriously by stray currents from the Rhode Island Company's street railway system, due to failure to bond its rails properly.

Instances of serious damage include the bursting of a service pipe badly affected by electrolysis, resulting in the flooding of a store, and the perforating of a meter and lead service pipes which produced damaging leaks.

A total of 2,191 open and defective rail joints, or about 13 per cent of all the joints on the system, was disclosed by the investigation which led to the report. Already 700 have been attended to, at the suggestion of the engineer, during the progress of investigation, which has continued during the past seven months.

The report recommends that temporary bonding be required at points where new tracks are being laid or where repairs are being made; that broken and imperfect rails be repaired or taken up as soon as discovered, and that the Rhode Island Company adopt at once the electrical method of bonding the rail joints. Electric welding was formerly recommended, but it was thought local conditions did not warrant the expense.

New York Show Opens.

The New York Electrical Exposition was opened on Wednesday afternoon, October 6, under auspicious circumstances. An address was made over the telephone by President Moore of the Panama-Pacific Exposition, and was listened to by over 200 invited guests holding telephone receivers. Arthur Williams responded over the telephone. Other addresses were made by E. W. Rice, president of the General Electric Company; by John W. Lieb, of the New York Edison Company, and by H. S. Brooks, of the American Telephone & Telegraph Company.

Civil Service Examination for Junior Electrical Engineer.

On October 20 the United States Civil Service Commission will hold examinations in the usual places throughout the country for eligibles to fill vacancies in the staff of the Interstate Commerce Commission, which is making a valuation of the properties of all common carriers throughout the country. The particular positions are designated as Junior Electrical Engineer, Grade I, salary $1,000 to $1,680 a year, and Grade II, salary $720 to $1,080 a year. The duties of this position contemplate chiefly field work, and traveling expenses will be allowed.

Applicants should be between the ages of 21 and 36. Applicants will be examined on the theory and practice of railway electrical engineering as applied to electric traction power engineering and transmission, lighting and motor drive and the mathematics used in this work. One-half of the credit in the examination will be based upon education, training and experience. Applicants for Grade I must have had four years' experience in railway electrical engineering, of which at least two years must have been with an electric railway or an electrified division of a steam railway. Applicants for Grade II should have had two years' experience in railway electrical engineering, of which one year must have been with an electric railway.

Further details in regard to this examination can be obtained from the United States Civil Service Commission, Washington, D. C., or from the secretaries of the local civil service boards by writing for circular No. 852.

Plans for Development by Ontario Hydro-Electric Power Commission.

Plans for power development that will make the Hydro-Electric Power Commission of Ontario independent of all private developments and provide a supply sufficient, not only for the next few years, but for many years to come, have been given final approval by the Commission and sent on to the Provincial Government.

As outlined by Sir Adam Beck, chairman of the Commission, several months ago upon the opening of the first "hydro-radial" (or rural) car line in the province, the plans call for an initial development of 100,000 horsepower by utilizing the maximum head of power on the Niagara River, now undeveloped. The plans, it is understood, outline a possible supply from this source of 250,000 horsepower, and cover as well developments possible from the utilization of the Welland Canal spillways, which will add as much to the power supply of Ontario.

The plans are the result of over a year's work by the engineers of the Commission, and for the guidance of the Canadian Government have been completed in great detail, with careful estimates of cost and production.

The construction of a great development plant in the Niagara district has become an urgent necessity by the rapid growth of the cheap power system in Ontario. Sir Adam Beck and his colleagues on the Commission are facing the end of their present sources of supply. The 100,000 horsepower supply contracted for with the Ontario Power Company at the Falls will soon be exhausted by the increasing demands of the municipalities which even the big increase in the supply from new plants here and there in the province will not meet. With the advent of hydro-radial car lines on an important scale, the present supply will fall far short, and when that time arrives the Commission must be in a position to furnish practically unlimited power.

Annual Meeting of Chicago Section, Electric Vehicle Association of America.

The fourth annual meeting of the Chicago Section, Electric Vehicle Association of America, was held on Tuesday evening, October 5, at the Hotel La Salle. The report of the Nominating Committee, presented by D. C. Arlington, was accepted and the following officers elected for the ensuing year.

Chairman, George B. Foster.
Vice-chairman, W. F. Bauer.
Secretary-treasurer, F. E. McCall.

Executive Committee, D. M. Simpson, Gail Reed, A. J. Brechtel and W. C. McNitt.

The retiring chairman, W. J. McDowell, conducted the business meeting and reports reviewing the work of the year were presented by the chairmen of the various committees.

Following the reports brief addresses were made by Robert Bland, W. B. Taylor, George B. Foster and the new officers. Homer E. Niesz acted as toastmaster and at the close of the program presented Mr. McDowell with a diamond-studded emblem, on behalf of the Section.

BOOSTING ELECTRICAL PROSPERITY WEEK.

Sandusky Makes Elaborate Plans for Electrical Prosperity Week.

Sandusky, O., claims a unique feature for the forthcoming celebration of Electrical Prosperity Week. One day during that week, members of the Sandusky Ad Club, city officials, electrical people and citizens generally will make a pilgrimage to Milan, O., to pay their homage to Thomas A. Edison at the place of his birth. A committee of citizens is now engaged in working out a program for this day, and it is tentatively planned to make it a rather ceremonial occasion. A strenuous effort will be made to induce Mr. Edison to revisit the place of his birth for this occasion; but in any event the pilgrimage will be made.

Milan is a village of about 500 population, located 14 miles south of Sandusky and in the same county. The old Edison home still stands and is the show place of the village. Many of the older residents still remember "Tom" as a bare-legged boy, with a mania for "tinkering."

Sandusky's celebration of Electrical Prosperity Week will be in charge of the Ad Club (composed mainly of retail merchants), the Federated Commercial Club, and other civic organizations, co-operating with the Sandusky Gas & Electric Company, and city officials. It is proposed to put on an electrical show on the largest possible scale.

St. Louis Jovians Hold Prosperity Meeting.

The first fall meeting of the St. Louis Jovian League of Electrical Interests was held at the American Annex on September 21 at noon. Frank D. Beardslee, president, opened the meeting and announced the next Rejuvenation, which was to be held Friday, October 8.

The topic of the day was "Optimism, Progress and Business Prosperity" with W. N. Matthews, twelfth Jupiter, as the presiding officer.

Mayor Kiel was the first speaker and spoke of the "Progress of Civic Development." A. C. Einstein, the next speaker, said the time for optimism, progress and business prosperity was opportune. He spoke of "Prosperity Week" which will be conducted the week of November 29 to December 6, over the entire United States by the Society of Electrical Development. He also told of the plan of the Union Electric Light & Power Company to advertise St. Louis as a city with advantages for the establishing of industries and jobbing houses. Mr. Einstein called the attention to the fact that in many lines of manufacture and the distribution of commodities St. Louis was a world leader.

Hugo Wurdack said that from the viewpoints gathered from ten different states that prosperity was coming; that

the people were getting interested in their own business and letting other people conduct theirs. "As soon as we get in the attitude," said Mr. Wurdack, "of recognizing the rights of the other fellow to make a living, we will have prosperity. I want to say to you men who travel, boom St. Louis. When you sit around the hotel table and in the hotel lobby, boom St. Louis. Believe in your town; brag on St. Louis as you brag on your wife's cooking. You must do this if you want harmony."

The League adopted various resolutions indorsing a national prosperity movement.

Rotary Clubs to Hold Electrical Meetings.

At the recent convention of the International Association of Rotary Clubs of the World, held at San Francisco, the electrical trade sections decided to hold special electrical meetings during Electrical Prosperity Week. A resolution was adopted by each of the electrical sections endorsing the Electrical Prosperity Week campaign, and recommending that all meetings of Rotary Clubs held during the week from November 29 to December 4 be devoted to the subject of electricity and its bearing on the progress, prosperity and comfort of the people. The Society for Electrical Development was requested to mail copies of its prospectus to the president and secretary of each Rotary Club and to all members of the electrical sections.

There are 170 of these Rotary Clubs located in different cities, with a total membership of about 17.000. Trade sections exist for electric light and power, electrical construction, electrical supplies, electric lighting fixtures and transportation, the latter including electric street and interurban railways.

Bill-Posting Campaign for Electrical Prosperity Week.

To bring Electrical Prosperity Week to the attention of every person in the United States, the Society for Electrical Development has instituted a national co-operative billboard campaign in addition to its many other publicity features operating for the success of Electrical Prosperity Week, the six-day celebration to be held from November 29 to December 4.

The posters provided are eight sheets 8 feet 10 inches high and 6 feet 8 inches wide that can be used singly or be made up into 16 or 24 sheets. They present the "Goddess Electra" emblem of the big celebration, attractively lithographed in six colors. At the bottom is left a space for the name of the electrical firm making use of the posters. The posters will be placed on the most prominent billboards and will be displayed during the time when numerous other means are being used to promote electricity and Electrical Prosperity Week. The use of these broadsides will therefore be of timely advantage to every central station and merchant.

Billboard advertising for such a campaign has been found to be of unquestioned effectiveness. It appeals by pictures rather than by words and therefore is quick to arrest the attention. These posters reach the people of every walk of life. Their size enables their message to be read at a considerable distance away. Publicity experts declare that merchants whose names appear upon these posters will gain a volume of timely publicity which will prove a lasting stimulation to their business.

The Society for Electrical Development has issued an attractive folder which illustrates the poster as it will appear upon the billboards, specifies sizes and gives instructions for its use.

Texas Central Station Conducts Prosperity Campaign.

An active campaign is now being waged by the Texas Power & Light Company to induce all merchants in towns where the company operates electrical properties to participate in "Electrical Prosperity Week."

"We have taken this matter up with Chambers of Commerce and Young Men's Business Leagues in the more important cities where we operate," writes J. H. Moseley, advertising manager for the company, "and are reciving considerable encouragement. So far, every city heard from has expressed interest in the plans and has offered to co-operate. It is probable that the week will be known simply as "Prosperity Week." The merchants are expected to participate by offering special inducements during this time."

"The idea of requesting all newspapers to refrain from displaying "war news," or news of crimes, etc., on their front pages during this week has been incorporated in the plans and several papers have already promised to comply with the request.

To Celebrate "Edison Day" at Texas State Fair.

The officials of the State Fair of Texas, which will be held at Dallas from October 16 to 31, have decided to set aside October 21 to be known as "Edison Day" in celebration of the thirty-sixth anniversary of the discovery by Thomas A. Edison of the first incandescent lamp.

As a souvenir of the occasion the Edison Lamps Works will furnish a large number of stick pins on which a miniature of Edison's first lamp is mounted. The stick pins will be distributed through the Texas Power & Light Company which will have a special display in its exhibit booth featuring the development in the lamp business.

Central-Station Executive Predicts Returning Prosperity.

Louisville Jovians, in the way of publicitiy in connection with preparations for Electrical Prosperity Week, have published, in display form, a letter written by Donald McDonald, vice-president and general manager of the Louisville Gas & Electric Company, to R. E. Brian, manager of the Louisville branch of the Federal Sign System (Electric). This letter, used in connection with a picture of Mr. McDonald, is in reply to an inquiry addressed by Mr. Brian to the writer, and which appears to have related to business prospects. Mr. McDonald, in his reply begins by saying: "I can see nothing ahead for this country except abundant prosperity." He then discusses the causes that made for resumption of business, says that the chances of this nation becoming involved in war are less all the time, and concludes:

"The course of the speculative market shows that a very large number of people who have money with which to back their opinions take the same view of the matter I take. They are buying stock now, because they believe that the immediate future will show large increases in the earnings of these stocks. Where these purchases are made by persons who are strong enough to hold what they have bought and not be compelled to sell on the first drop, I believe the event will show that the men who are buying now have correctly foreseen the future. In fact, I am at present an optimist."

Chattanooga Jovians Enlist Merchants in Prosperity Propaganda.

Local Jovians of Chattanooga, Tenn., have taken up actively the promotion of "Electrical Prosperity Week" and have appointed a special committee to work out plans for the celebration. Local merchants are entering into the spirit of the movement, especially since it will work in with their plan to inaugurate the Christmas shopping season on November 27. The same decorations by the merchants will serve both purposes, and the retail trade is giving its endorsement to the movement.

Pittsburgh Electrical Interests Arrange for Prosperity Week.

Electrical interests in Pittsburgh, Pa., are working energetically to make Electrical Prosperity Week a notable success. A committee, of which Henry Harris is chairman, has been appointed to stimulate enthusiasm and to formulate definite plans for participating in the event.

A get-together meeting was arranged for the evening of October 8.

New Electrical and Mechanical Appliances

Frantz-Premier Electric Washer.

The electrically operated Frantz-Premier washer shown in the accompanying illustration makes use of the suction and compression principle. Rubbing is entirely eliminated and wear and tear on the clothes is reduced to a minimum. Two vacuum plungers move up and down inside the tub at the rate of 60 times a minute, revolving above the water and thus reaching all parts of the tub. On the down stroke of the plunger air is compressed and forces the soapy water through the mesh of the fabric, while on the up stroke the plunger reverses the operation, sucking the water through the mesh and carrying with it all dirt and foreign substances.

The washer and wringer are operated independently or together by a Westinghouse one-sixth-horsepower motor which is extremely durable and requires practically no attention. The entire machine is made of metal attractively finished and is simple in construction and easy to operate. It can be readily moved from place to place, casters being provided to facilitate this. The machine is durably built and in all respects up to the reputation of its maker, the Frantz-Premier Company, Cleveland, O.

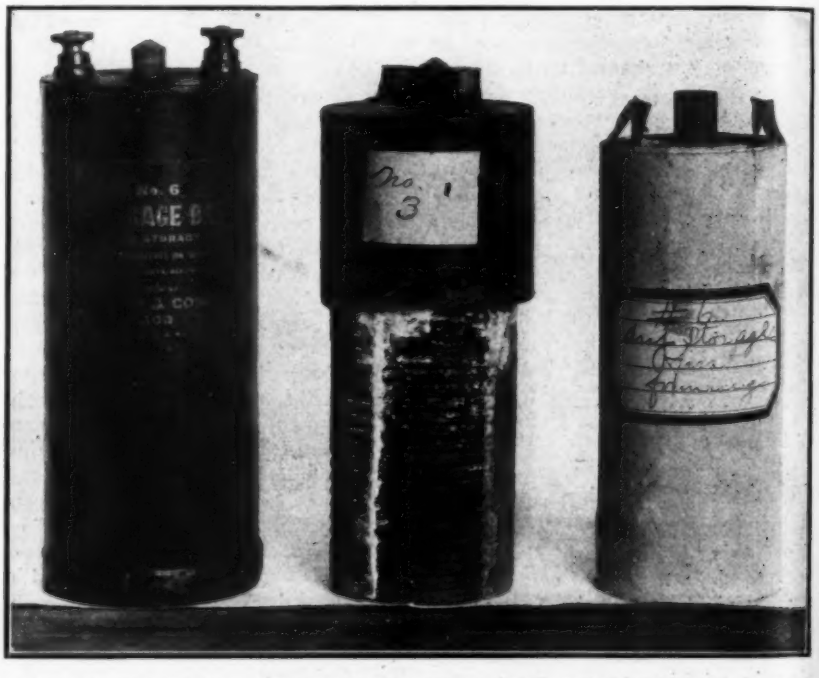
Frantz-Premier Electric Washer.

The Dry Storage Battery.

A storage battery employing a non-flowing electrolyte and made to conform in size and shape to the standard No. 6 dry cell is being placed on the market. Unlike the early types of storage batteries that used gelatine or a gelatinous electrolyte, the new battery is based on a structureless, amorphous, non-crystallizing white substance that has an exceptionally high absorbing power, permitting a container packed full of it to receive 90 per cent of its liquid capacity.

It is claimed that this flexible, absorbent separator can be boiled in the strongest sulphuric-acid electrolyte, then exposed to the air and it will not carbonize or darken in color. Furthermore, it adds practically no resistance to the cell. In its sheet form it is made to fill the predetermined space between the positive and negative elements when dry and under a considerable pressure, and leaves no space for washing or shedding or loss of active material. So long as a string of metallic lead support is left to the cell element, this spongy absorbent separator holds the active material pressed against it and active. It is claimed that loss of active material, as well as sulphating, is practically impossible.

The construction is somewhat unique, being a direct departure from present storage-battery practice in that cylindrical construction is adhered to. The positive and negative elements are made from lead in rolled strips. These are corrugated to furnish greater area for the active material, which is pasted to the plates. In the accompanying illustration the central view shows the construction of the plates with the flexible absorbent separators between them. The view on the right shows the separators used in assembling the cell, and on the left is shown the completed product.



Dry Storage Battery. Views Showing Complete Cell, Plate Construction and Partly Formed Element.

In the center of the cell is a tube for supplying water to guard against drying out. This tube also acts as a gas vent and as a means of taking up the changes of volume of electrolyte during charge and discharge.

The container for the cell was developed from the point of necessity to avoid the expensive and breakable hard-rubber container. It is a paper-fiber can, made proof against water, acid and electrolysis and is unbreakable. It is pulverized and vulcanized at a high temperature, and has a coal-black glossy finish. The finished cell is neat in appearance and durable.

After careful and exhaustive tests as to the operating characteristics of the new battery, it is claimed by the manufacturers that it holds its charge longer and can be recharged indefinitely for much less than the cost of a carbon dry battery. It has 40 per cent higher working voltage, greater amperage, greater watt-hour output and five times more working capacity. The capacity of the No. 6 size is one-half ampere for 28 hours when fresh from the factory. The manufacturer asserts that the capacity increases with use and attains a value of 0.5 ampere for 40 hours, one ampere for 18 hours, two amperes for 8 hours and three amperes for 5 hours. The average voltage of discharge is two volts.

While at present made only in the size of the No. 6 dry cell, the new battery will later be made in various sizes for all purposes. It is guaranteed against internal short-circuits and against drying.

The "dry" storage battery is manufactured by J. P. Mentzer & Company under Crowdus patents. S. S. Stolp, 134 South La Salle Street, Chicago, is sole sales agent for the company.

Simplex Pole Jack.

Electric light and power companies, also telephone companies, especially those operating in the larger cities, frequently have occasion to move poles from one location to another or to take them out entirely. The removal of the poles is by no means an easy job, as it requires considerable time in addition to a number of men.

A new pole jack recently placed on the market has been especially designed for the purpose of removing poles. It supersedes in effort, time and expense all former means of pulling a pole and eliminates the necessity of digging around the pole. A general view of this tool is shown in Fig. 1.

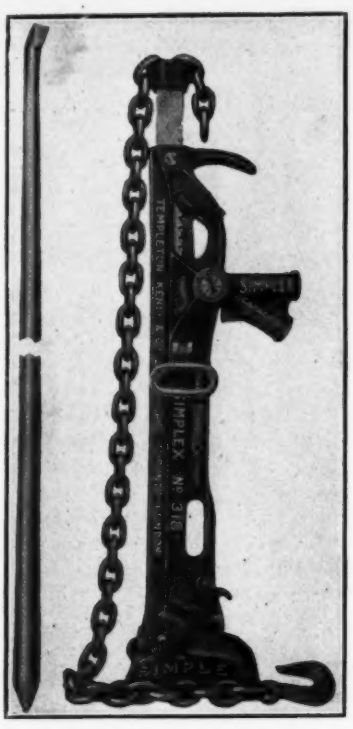


Fig. 1.—Simplex Pole Jack.

The jack in use is shown in Fig. 2. In this case the pole was about five feet in the ground, had a big butt and had been solidly imbedded for years. It took just 19 minutes for the Simplex jack to pull it straight from the earth and this without preliminary digging around the pole. The time necessary by former methods of first digging and operating with roller and rope, would have approximated an hour and a half; hence as a labor-saving device the tool should quickly pay for itself.

This Simplex jack is single-acting, operating on the down stroke of the lever, or tripping at any point. In this way, at the end of its entire lift the cap may be dropped back to take a new hold on the pole. The capacity is 15 tons, lift 24 inches and full height 39 inches. It pivots on its own base from 30 to 90 degrees to the horizontal and follows the angle of the pole being pulled.

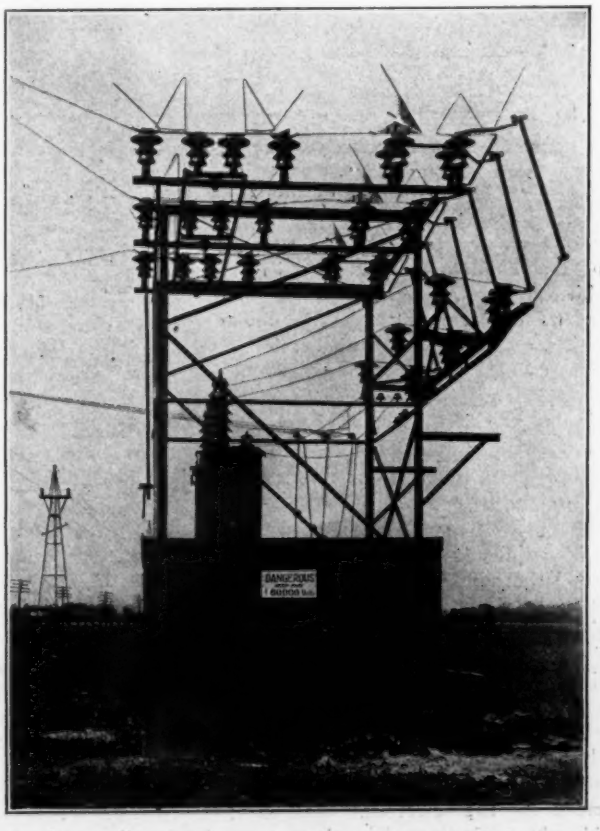
The cap is recessed to firmly hold the links of a chain when they are dropped in position. This chain with grab hook attached is furnished with the jack and is of sufficient length to wrap once around the average pole. An I-beam base support acts as a substantial foundation where the ground is soft or hollowed. The standard is a heavy malleable casting. All other parts are drop forgings. The double-lever socket insures a convenient position of the lever bar with the jack at any angle. A five-foot steel lever bar of pinch-bar construction also forms a part of the equipment.

This jack is designated as Simplex No. 318 and is manufactured by Templeton, Kenly & Company, Limited, 1020 South Central Avenue, Chicago, Ill.

Low-Capacity 66,000-Volt Sub-Station.

The accompanying cut illustrates a low-capacity 66,000-volt substation de-

Fig. 2.—Pole Jack Lifting Pole from Position.



66,000-Volt Outdoor Substation.

veloped and built by the Railway & Industrial Engineering Company, Pittsburgh, Pa. The station shown is at Bergen, N. Y., and is one of several on the lines of the Niagara, Lockport & Ontario Power Company, used to serve power to various towns.

At the Bergen sation there are at present installed two 25-kilowatt 66,000-volt Westinghouse transformers, but the platform on the steel structure is arranged so that a third transformer can be installed later when the load is increased. The switching and protective apparatus consists of a standard 70,000-volt Burke horn-gap switch and Burke horn-gap lightning arrester, choke coil and fuse. The station is complete in every respect, but very simple and compact, all of which is necessary for a station of this low capacity where the initial investment must be kept at a minimum in order to return a proper income.

Rush Construction at Night Facilitated by Tungsten Lighting.

A large reinforced-concrete building now under erection in the East is urgently needed for manufacturing purposes. This work is prosecuted in two shifts, night work being carried on by means of large clusters of tungsten lights, as shown in the illustration.

Illumination to Facilitate Factory Erection.

The lights used were 100-watt tungsten lamps. These were hung both singly and in clusters of six upon home-made stands. For isolated lamps the Milburn type was used. No reflectors other than those supplied with the Milburn lights were used.

The lighting from this source is so good that the work proceeds with the same certainty and precision, and practically with the same speed as in the daytime. By handling the matter in this way the owners will get the building several weeks earlier than would have been possible by the regular one-shift method of construction.

The lighting arrangements were made by the electrical staff of the Aberthaw Construction Company, of Boston, Mass., which has the contract for the entire structure.

Teaching the Young to Cook Electrically.

A unique feature of the Electrical Exposition and Motor Show being held at New York City, is in a section of the New York Edison Company's exhibit, where the new Western Electric-Hughes Junior range is being demonstrated.

This range, which was recently described in these columns, and which a prominent central-station man has characterized as "the greatest electrical novelty in years," is a practical, miniature electric range, complete in every detail, upon which real food can be boiled, baked or fried. It is intended for the use of young girls as a toy, and also as a means whereby they may be taught to cook.

As a direct tribute to the educational value of this device, the Board of Education of the city of New York has arranged with the New York Edison Company to send squads of young girls from the public schools to visit this exhibit and receive instructions in the art of cooking electrically, using the range in the demonstrations. Opportunity is afforded the school children to do some of the cooking themselves, in order to give the instruction work its greatest possible value.

This feature is to be continued throughout the duration of the show, which closes on October 16. It will serve, as few other things could, to impress the new generation with the "Do It Electrically" idea.

Water-Current Meters.

Electrically controlled meters are being used on the Panama Canal to measure simultaneously the direction as well as the velocity of water currents in the canal and its tributary works. By this means currents from 0.15 to 20 miles an hour can be measured.

New Electrically Operated Pumping Outfit.

The illustration herewith shows a new pumping outfit of the triplex type recently designed by the Buckeye Pump & Manufacturing Company, Columbus, O., for house-pumping service. The outfit illustrated has a capacity of 180 gallons per hour, and will pump against pressures of 25 to 50 pounds. The overall dimensions of the complete set are 17 by 13 inches by 12 inches high. The weight is 100 pounds.

If it is desired to mount the outfit on the wall instead of the floor it can be furnished with brackets instead of the legs shown in the illustration.

The plungers are bronze and are driven by a cam shaft. They are self-lubricating. Each cylinder has independent suction and discharge check valves. Any obstruction becoming lodged under one check valve will therefore not interfere with the operation of the other cylinders.

Electrically Operated Pumping Outfit.

The outfit is equipped with a one-sixth-horsepower direct-current or alternating-current motor, as specified, made by the Robbins & Myers Company, Springfield, O. The pump and motor are connected through a worm and spiral-cut gear which operate in a tight grease-packed case.

An automatic controller is provided which cuts the motor in when the pressure in the tank falls to 25 pounds and cuts the motor out when the pressure reaches 50 pounds. A knife switch and fuse block are also furnished, mounted in front of the motor on the base plate.

A new chemical laboratory building is being erected for the Bureau of Standards, Washington, D. C. Its cost will be about $200,000.

New Automatic Starters for Alternating-Current Motors.

The accompanying illustrations show two new types of automatic starters for alternating-current motors operating on 110 to 550-volt, 25 to 60-cycle systems. One is designed for use with single-phase self-starting motors, or with polyphase squirrel-cage motors and uses resistance in the primary cir-

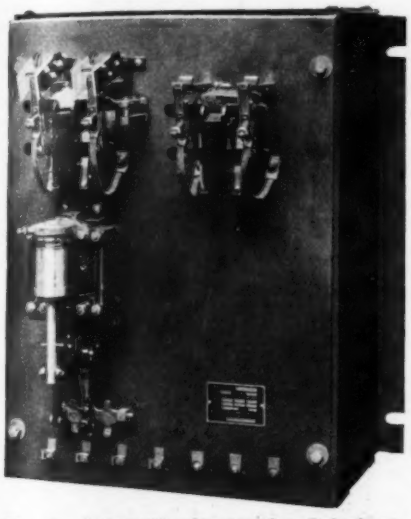


Fig. 1.—Automatic Starter for Polyphase Squirrel-Cage Motors.

cuit of the motor to reduce the voltage for starting. Two double-pole magnet switches and a solenoid-operated timing relay are provided. One switch connects the motor to the line through the resistance and the other short-cir-

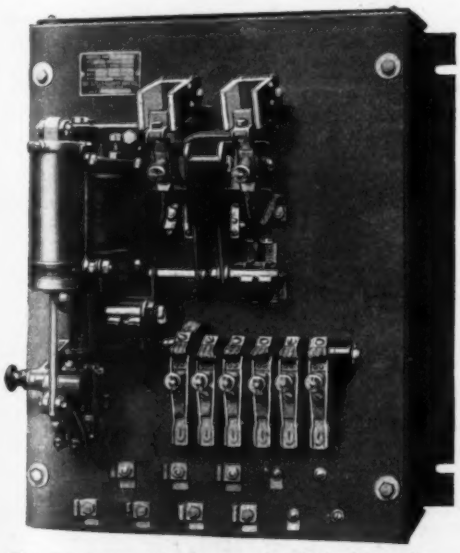


Fig. 2.—Automatic Starter for Polyphase Slip-Ring Motors.

cuits this resistance after a definite time interval, determined by the setting of the relay.

The controller shown in Fig. 2 provides automatic means for starting and stopping polyphase slip-ring motors driving pumps, compressors and similar machines. A double-pole magnet switch with blowouts handles the primary current, while the secondary resistance is cut out of circuit and the motor accelerated by means of a multiple-finger solenoid-operated rheostat. These automatic starters are particularly applicable to installations where the load is likely to vary between wide limits. They are manufactured by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

Both types of controllers illustrated may be controlled by single-pole knife or snap switches, by float switches on open-tank pumping systems or by pressure or vacuum regulators on closed systems.

Motor-Driven Meat-Chopper.

Every progressive business man knows that a clean, up-to-date, attractive store is an invaluable asset, the possession of which aids considerably in building up store prestige in his community. While this is true to a certain degree of every business, it applies particularly to those lines in which the handling of foods is involved. The grocery store, the confectionery shop, meat market, all must be inviting or the public will go elsewhere.

The use of electrically operated devices in the modern store, besides contributing to the appearance, does much toward increasing business by reducing the time required to make a sale. For instance, the machine illustrated herewith, made by the Hobart Electric Manufacturing Company, Troy, O., will chop over three pounds of beef per minute, whereas with a hand-operated chopper the operation would require several minutes. Also, another customer can be served while the machine is doing the work. A one-half-horsepower Westinghouse motor of special design is used; a snap switch on the device starts and stops the motor.

This machine is capable of performing a broad range of service. While intended primarily for meat chopping, the following attachments may be used: grindstone for tool grinding; pulley for light work, such as kraut cutting and meat slicing; bone-cutter to interchange with the chopper; and a grinder, making it suitable for coffee or pepper grinding. When used in a store handling both meats and groceries, these features are specially valuable.

Motor-Driven Meat Chopper.

Telephone-Booth Fans Solve Another Problem.

Talking-machine records must be demonstrated to be sold, and this demonstration must be made in a quiet room to be most effective. These rooms must also be cool, and the air in them fresh, or else the prospective customer is not in buying mood. The regular type of electric fan has been tried, but the quietest of them was found to make too much vibration, which was transmitted to the wooden partitions of the demonstrating rooms or booths, thus interfering with the playing of the records.

After many experiments a Pittsburgh sales concern installed a number of telephone-booth fans, and found that they gave the required ventilation, and on account of their special spiral-spring suspension were found to be without any vibration while in operation.

Telephones in China.

Telephone systems in China exist at Shanghai, Hongkong, Tientsin, Peking, Dairen, Mukden, Hankow, Soochow, Tsingtau, Kinkiang, Sanjoabu, Harbin, Antung, and Hangchow.

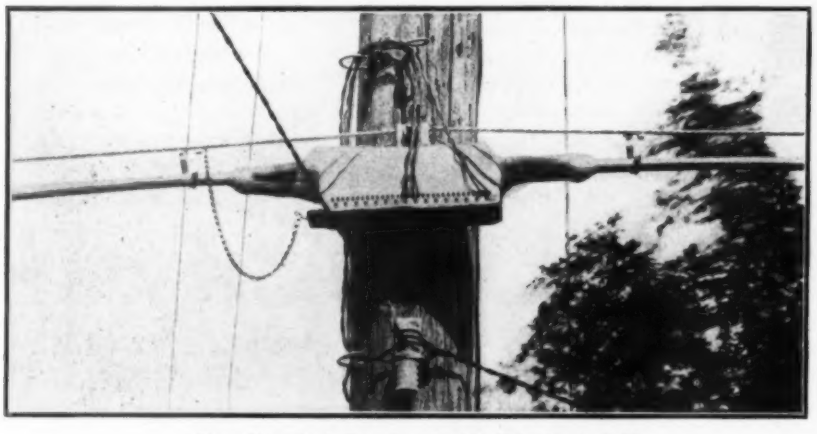
Until recently telephones were but little used by the Chinese natives.

An Aerial Telephone-Cable Terminal.

The growing use of aerial cable for telephone lines is directing attention to the development of cable terminals by those interested. One of the new patented cable devices controlled by Henry E. Zipkie, 1903 Avenue I, Brooklyn, N. Y., shows many interesting features. It is die-cast of lead with both outer and inner face plates through which the bolts pass with locknut fastenings; the space between the plates is filled with compound which prevents moisture entering the sleeve.

These terminals can be used to advantage in suburban construction where cement poles are placed in back yards. No trouble can arise from snow packing in them; no moisture condensing on binding posts and running down the face plates. The terminal may be opened in wet weather for transfer and tests, and there need be no splicing of bridle wires to make transfer.

A considerable saving can be made in both material and labor items in the installation of these boxes, and the upkeep is materially lessened.



New Terminal Box for Aerial Telephone Cable.

It is said that 60 per cent of aerial-cable trouble is due to broken tail ends caused by the cable creeping. This box does away with tail ends and creeps with the cable, thus entirely eliminating this trouble.

The box can be placed on existing cables by using it as a split sleeve. In new construction it can be hung on messengers and the cable pulled through the box. The device can be made advantageously as a six or eleven-pair box.

Control-Board for Series-Parallel Battery Charging.

The Globe Electric Company, 195 Broadway, Milwaukee, Wis., is putting out a new type of board for series-parallel charging of Edison storage batteries especially adapted for 30 and 60-volt systems. The arrangement of the board is very simple and embodies all of the features commonly used in a battery lighting system. The equipment consists of a 16 by 30-inch slate panel containing the following parts:

A voltmeter with a rear-of-board type switch with which it is possible to obtain the voltage of the battery, of the lights or of the generator, and an extra connection is provided. This extra connection has a pair of flexible cords connected to the contacts of the extra position, which permit the reading of individual cells or the testing of an automobile battery. An ammeter is provided with a scale having a zero center. This meter has a switch in its circuit which is connected in a manner that permits independent indications of current for either dynamo or battery. In this way it is always possible to determine the dynamo load when lights are burning; this has an advantage over the usual method of employing an ammeter placed in the battery circuit only.

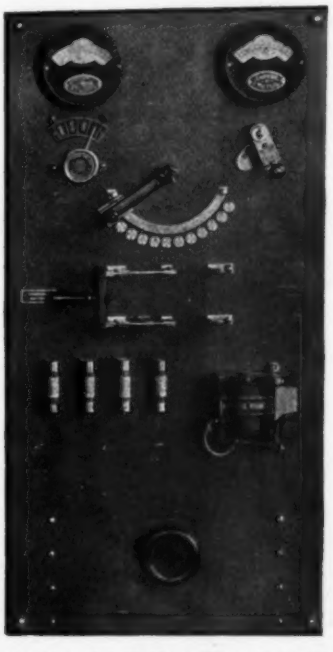
Where lights are used at the same time that the battery is being charged, it is desirable that the switchboard should permit ampere readings of the battery-charging current and the total load on the dynamo, for store-lighting and commercial-lighting plants are generally operated during the lighting hours.

A charging resistance is arranged with a dial switch having 12 points which permits charging at any current rate. This is particularly desirable where lighting is being done at the same time that batteries are being charged, as it enables the operator to charge the battery at any rate of current that may be available. The resistance is designed to charge the batteries at a range of from 50 per cent above normal charging rate to 50 per cent below normal charging rate.

A double-pole double-throw switch with contact for resistance is provided. The usual series-parallel connection is made to this switch which places the batteries in series on one side and in series-parallel on the other side. Charge and discharge name plates are provided.

An automatic contactor, which automatically opens and closes the circuit between dynamo and battery, takes care of the dynamo circuit entirely independent of manual attention. This contactor is provided with carbon contacts of high carrying capacity and these contacts prevent freezing or blistering of contactor. The contactor opens under a very small reverse current and is of heavy sturdy construction designed for hard usage.

This switchboard accomplished everything that may be desired in a series-parallel equipment for small lighting plants and does not have any unnecessary complicated features that do not add to the successful operation of the equipment. This style of board has been standardized and is carried in stock.



Series-Parallel Battery-Charging Panel.

Aid to Export Trade.

A new government publication of interest to manufacturers desirous of developing export trade is "Foreign Publications for Advertising American Goods," which gives advertising rates, circulation, subscription price, etc. It is No. 10 of the Miscellaneous Series issued by the Bureau of Foreign and Domestic Commerce. The list of advertising mediums in foreign countries is arranged alphabetically according to the various countries, thus making reference very easy.

The price of this pamphlet is 25 cents, and it can be obtained from the Superintendent of Documents, Washington, D. C.

Current Electrical News

ATLANTIC STATES.

LEBANON, PA.—The Board of Education will shortly open bids for the erection of a $175,000 high school building here. A. A. Richter, of Reading, Pa., is the architect.

PHILADELPHIA, PA.—Bids will soon be asked for a $500,000 high school building to be erected at Amber and Cumberland Streets, for the Philadelphia Board of Education. J. Horace Cook, Philadelphia, is the architect.

NORTH CENTRAL STATES.

CLEVELAND, O.—The sum of $75,000 will be expended to extend west side lighting. Address Maurice Sarbinsky, secretary of Public Utilities.

BICKNELL, IND.—A stock company, to have $1,000,000 capital stock, was organized in this city by A. L. Brockssmith, superintendent of the Bicknell Light and Power Company. The company expects to build a power station at Apraw Falls, on White River two miles south of this city, and provide power for coal mines operating in this field. It also intends to build an electric line connecting the mines.

CORNELL, ILL.—Work will commence immediately on the rebuilding of the electric light system in Cornell. Address president of the Public Service Company.

EAST ST. LOUIS, ILL. — The capital stock of the East St. Louis Light and Power Company has been increased from $1,000,000 to $1,100,000.

GALESBURG, ILL.—An ordinance has been passed by the city council setting October 26 for holding an election to vote on a $20,000 bond issue for the installation of additional equipment at the electric lighting plant.

KANKAKEE, ILL. — Ways and means are under consideration for more street lights. Address Mayor Alpiner.

NORMAL, ILL.—Cluster lights are to be provided for the business section of Normal. Address chairman of the Electric Light Committee.

ROSEVILLE, ILL.—Contracts have been signed between the village board of Roseville and the Public Service Company of Central Illinois, for the furnishing of electric light to Roseville. The Central Illinois company is to secure the current from the Monmouth Public Service Company, of Monmouth, Ill. A right of way is to be secured for the pole line from Monmouth to Roseville and as soon as this is done work of constructing the line will be begun. It is expected the line will be in operation within sixty or ninety days. Z.

URBANA, ILL.—Plans for the installation of a boulevard lighting system on West Green Street are under consideration by the board of local improvements. Z.

MARATHON, IOWA. — The town has voted $12,000 in bonds for a municipal electric lighting plant. Address the town clerk.

HAVENSVILLE, KANS. — Bonds to the sum of $8,000 have been voted to build a transmission line and wire the city. Address the city clerk.

TEKAMAH, NEB. — The municipal lighting plant is planning to erect a new power house soon, and will purchase one 150-horsepower Corliss-type steam engine, two boilers, and one 100-kilovolt-ampere generator and switchboard. Address F. A. Nassum, mayor.

SOUTH CENTRAL STATES.

NICHOLASVILLE, KY.—The city council committee, which has been investigating the proposition to construct and operate a white way on Main Street, has decided to make a favorable report on that project. G.

GROVE, OKLA.—The contract for constructing extensions and enlargements of the electric light and water works systems here will be awarded soon. The proceeds from the sale of $10,000 bonds will be used for the purpose. D.

LAHOMA, OKLA. — A municipal electric light plant to cost about $5,000 will be built here. D.

LITTLE ROCK, ARK. — The city will expend $25,000 for 210 street lights, five transformers, accompanying equipment, etc. Address John W. Bleidt, city electrician.

COMANCHE, TEX.—The city has granted to the Texas Power and Light Company a franchise to sell electricity for light and power purposes in Comanche. It is stated that power will be supplied by means of a transmission line built from Brownwood. Several small towns between Comanche and Brownwood will be served.

DENISON, TEX. — A deal involving the final purchase of a 50-acre site for a mammoth power plant, to be erected on the Red River by the Texas Power and Light Company, has been consummated. The site selected is above danger of floods from Red River. Announcement was made that work on the plant would in all probability be started by January 1. An interurban line from Denison to Durant, Okla., is another project under consideration.

PLAINVIEW, TEX.—The town of Lubbock is now being lighted from the Malone Light and Ice plant, at Plainview. The towns of Hale Center and Abernathy are to be supplied from this plant in the near future.

ROYSE, TEX.—Arrangements have been completed whereby the Texas Power and Light Company will take over the electrical properties in Rockwall, Garland and Royse. A transmission line will be built from Royse to Jenkins connecting with the present 33,000-volt line of the company. A survey of the proposed transmission line, which will be about 20 miles in length, will be made at once.

WESTERN STATES.

ANACONDA, MONT. — Officially reported the council has passed a resolution creating special improvement District No. 70, wherein an ornamental lighting system will be installed at a cost of approximately $5,000. The territory covers Hickory Street, from Third Street to Park Avenue, Park Avenue from Hickory Street to the city limits on the west. M. J. Kelly, city clerk, states that bids for the installation and furnishing of materials will be called for shortly. O.

BOZEMAN, MONT.—C. A. Speith, city clerk, reports the city council has rejected the eight bids submitted for the installation of an ornamental street-lighting system, and has decided to install the system by day labor, under the personal direction of Assistant City Electrician E. V. Smith. O.

KELLOGG, IDAHO.—Power transmission lines will be constructed to the Highland Surprise mining property, on Pine Creek, by the Washington Water Power Company, of Spokane, Wash., according to announcements recently made by officials of the company. The current to be provided will be utilized to operate the mine and stamp mill of the Highland Surprise Company. O.

PHOENIX, ARIZ.—J. B. Girand, city engineer of this place, will make preliminary surveys for six dams at the proposed sites of six hydroelectric power plants to be erected in the Grand Canyon of the Colorado. According to the plans, the first power plant will be erected in Diamond Canyon, north of Peach Springs, where it is expected to develop 50,000 horsepower. The six plants are expected to developed about 400,000 horsepower. The United States Department of the Interior has granted permission for the preliminary surveys to be made.

PHOENIX, ARIZ.—Bids have been called for by the city manager for not less than 25, nor more than 300 ornamental electric light standards, according to plans of the city engineer.

LAS VEGAS, N. M.—Plans are under way for the ornamental electric lighting of the Plaza in this city.

OLYMPIA, WASH. — The city council is about to grant an electric light and power franchise to Wilbur B. Foshay, Portland, Ore., same being for a period of 50 years. The franchise will permit Foshay to sell electric current to this city, and will also give him a 50-year franchise for a steam-heating plant. This legislation, it is understood, provides for municinal ownership of a lighting plant. The franchise provides that the city may purchase the plant at the end of five-year periods during the life of the fran-

chise, at a price to be fixed by a board of arbiters. O.

WENATCHEE, WASH.—On September 24, a fire caused by short-circuit in a temporary wooden switchboard, practically destroyed the entire plant of the Dryden station of the Wenatchee Valley Gas and Electric Company, which is the largest plant maintained by the company in this section. The loss will seriously affect the company's business, as the Dryden plant developed 80 per cent of the electricity sold by the company. O.

ALBANY, ORE.—William Hoeflich, formerly with the Oregon Power Company, operating here, and a group of local capitalists, have petitioned the city council for a franchise to construct, operate and maintain an electric lighting and power plant to serve this city in competition with the Oregon Power Company. O.

PORTLAND, ORE. — Plans are in contemplation for the electric lighting of several of the city parks that are now without illumination. Commissioner Baker, of the Department of Public Affairs, has the matter in charge.

SILVERTON, ORE. — At the last meeting of the city council an ordinance was introduced calling for bonds for the erection of a municipal electric lighting plant and distributing system.

LOS ANGELES, CAL. — The city council is considering the erection of hydroelectric power plants on Rush and Leevining creeks in connection with the city's Owens River water system.

ORANGE, CAL.—Plans are under way for the installation of a small electric lighting plant at the Orange County Park.

OROVILLE, CAL.—It is announced that the Great Western Power Company, of San Francisco, has arranged to buy the power plants and distributing system of the Oro Electric Company of this place. The latter company will continue its gold-dredging business.

PASADENA, CAL.—The city council has adopted a resolution providing for the ornamental electric lighting of Colorado Street.

QUINCY, CAL.—The Great Western Power Company has been granted a franchise permitting it to erect transmission lines along the county roads of Plumas County.

HONOLULU, HAWAII.—The East Maui Irrigattion Company, operating in the Island of Maui, is considering the construction of a hydroelectric power plant in the Koanae Valley, Maui, the power generated to be used for operating irrigation pumps.

NEW PUBLICATIONS.

ELECTRIC OVENS.—An article by A. E. Kennelly, R. D. Everett and A. A. Prior entitled "Thermal-Insulation Tests of Electric Ovens," has been reprinted in pamphlet form for distribution by the authors. It describes an experimental investigation of the resistance to heat offered by five different kinds of oven walls, which was carried out at Harvard University.

VACUUM LAMPS. — Scientific Paper No. 253, issued by the Bureau of Standards, Washington, D. C., is entitled "A Direct-Reading Device for Use in Computing Characteristics of Vacuum Tungsten Lamps," by J. F. Skogland. This gives a scale for the computations and explains how it is to be used. The advantages and disadvantages are discussed and the method of construction explained.

LAMP SOCKETS AND BASES.—The American Society of Mechanical Engineers has issued in pamphlet form the report of the Committee on Standardization of Special Threads for Fixtures and Fittings. This report, which has been corrected since being originally issued, deals with the sizes of rolled threads for screw shells of electric sockets and lamp bases. Recommended standards are given.

HOUSEHOLD MEASUREMENTS.—Circular No. 55, of the Bureau of Standards, is entitled "Measurements for the Household." This explains the units, methods and instruments of measurement useful in household activities, and indicates how to assure correct quantity in commodities bought by weight and measure. The watt-hour meter and its use are explained and directions given for reading the dials.

CANADIAN SALT INDUSTRY.—A report on the salt deposits of Canada and the salt industry has been issued by the Canadian Department of Mines, Ottawa, Canada. This is a comprehensive review of the industry in Canada and gives a large number of maps and illustrations showing the location of salt deposits and the methods of working them. Interesting descriptions are given of electrochemical processes used in this industry.

TELEPHONE DIAPHRAGMS. — Bulletin No. 7 of the Research Division of the Electrical Engineering Department of the Massachusetts Institute of Technology is entitled "Explorations Over the Vibrating Surfaces of Telephonic Diaphragms Under Simple Impressed Tones," by A. E. Kennelly and H. O. Taylor. This is a paper which was presented before the American Philosophical Society at the spring meeting in Philadelphia.

RULES FOR METAL MINES.—The Bureau of Mines, Washington, D. C., has issued Bulletin No. 75, entitled "Rules and Regulations for Metal Mines." This is a series of recommendations made by a committee appointed originally at a meeting of the American Mining Congress in 1906; this committee later served under the Bureau of Mines in drafting a proposed uniform law to cover the regulation of metal mines. This report covers 296 pages and gives a summary of the work of the committee which had the co-operation of nearly all interested in the mining industry.

UNITED STATES MINING STATUTES.—The Bureau of Mines, Washington, D. C., has issued what is designated as Bulletin No. 94, entitled "United States Mining Statutes Annotated." This is a work in two volumes comprising a total of 1,772 pages. It has been compiled by J. W. Thompson, of the Bureau, and shows the status of every Federal mining law, both laws relating to metal mining and those relating to coal, oil and phosphate mining, and to mining on public, Indian and railroad lands. This valuable work is obtainable from the Superintendent of Documents, Washington, D. C., for $2.50.

MAGNETIC OBSERVATIONS. — The Department of Terrestrial Magnetism of the Carnegie Institution of Washington has issued Vol. II of its researches entitled "Land Magnetic Observations 1911-1913 and Reports on Special Researches," by L. A. Bauer and J. A. Fleming. This is a large volume of 278 pages giving results of magnetic observations in various parts of each of the continents, with details of the field reports of the different observers and descriptions of the stations where observations were made. Reports are also included with respect to special researches made at the headquarters of the department and at various observatories, as well as those of a special trip during the total solar eclipse of 1911. The volume is illustrated.

PROPOSALS.

NAVY ELECTRICAL SUPPLIES.—The Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., will receive bids on October 19, 1915, for the following material: 4,300 feet lighting and power wire; 6,000 feet single, rubber-covered stranded wire; 1,000 feet lead-covered rubber-insulated wire, Schedule No. 8833, all for delivery at Navy Yard, Brooklyn, N. Y.; miscellaneous interior communication cable; 7,500 feet single conductor, soft steel wire, Schedule No. 8838, both for delivery at the Navy Yard, at Brooklyn, N. Y.

NEW INCORPORATIONS.

DAHLGREN, ILL.—The Dahlgren Electric Light Company has been incorporated with a capital of $25,000, by L. L. Aydt, William Acks and F. F. Aydt.

MELROSE, MINN.—The Grove and Greenwald Lighting and Power Company has been incorporated with a capital of $50,000, by Henry G. Meyer, Fred Gzieski and others.

ALBANY, N. Y.—Albany Storage Battery Company, Incorporated. Manufacturing, repairing and dealing in storage batteries, auto accessories, etc. Capital, $1,500. Incorporators: Christian F. Weeber, Pauline Weeber and Alfred C. Dederick.

WEST SALEM, ILL. — The West Salem Ice and Light Company has been incorporated with a capital stock of $15,000. The company is to manufacture and sell ice and electricity. W. E. Scheurer, P. O. Hallbeck and E. H. Hallbeck are the incorporators. Z.

ROCHELLE, ILL.—The Rochelle Electric Manufacturing Company has been incorporated with a capital stock of $35,000, and is to manufacture and deal in electric motors, dynamos and electrical appliances. W. R. Dusher, Frank Carney and J. C. Fesler are the incorporators. Z.

INDIANAPOLIS, IND. — Articles of incorporation have been filed by the Loco Light Company. The company is capitalized at $10,000, and proposes to manufacture locomotive headlights. The incorporators are Robert H. Pyle, Lewis J. Isbell, George D. Thornton and Arthur R. Baxter.

CHICAGO, ILL. — The Gardner-Stedman Company has been incorporated with a capital stock of $1,000. The company is to do electric wiring and construction work, and is to manufacture and deal in electric devices. Fulton Gardner, Seymour Stedman and Swan M. Johnson are the incorporators. Z.

FINANCIAL NOTES.

The Narragansett Electric Lighting Company will issue to stock and debenture holders of record of October 4, $500,000 of capital stock at par in the ratio of one share of the new stock for each 14 shares now held. Payment for the new stock is to be made November 1 and transfer books of the company will be closed from October 4 to October 16.

The Memphis Street Railway Company has sold to a syndicate composed of Bertron, Griscom & Company, Reilly, Brock & Company, of Philadelphia, and Counselman & Company, of Chicago, an issue of $1,500,000 two-year six-per-cent collateral gold notes, if, as and when issued, to be dated November 1, 1915, due November 1, 1917. It has also sold to Bertron, Griscom & Company and Reilly, Brock & Company an issue of $600,000 one-year six-per-cent guaranteed gold notes, if, as and when issued, to be dated November 1, 1915, due November 1, 1916. Out of the proceeds from the sale of these issues there will be met maturities of $1,000,000 debenture notes on November 1 1915, and of $906 000 Citizens Street Railway first-mortgage bonds on January 1, 1916, the balance going to working capital. The retirement of the Citizens Street Railway Company first-mortgage bonds will make the consolidated bonds of the Memphis Street Railway Company a first mortgage.

Dividends.

	Term.	Rate.	Payable.
Asso. Gas & Elec., pf...	Q	1.5 %	Oct. 15
Bell Telephone, Pa.....	Q	1.5 %	Oct. 15
Boston Sub. Elec.....	Q	50c	Oct. 15
Commonwealth Edison..	Q	2 %	Nov. 1
Dallas Elec., 1st pf.....	S	3 %	Oct. 11
Dallas Elec., 2d pf.....	S	2.5 %	Oct. 11
Edison Elec. Illmg., Brockton	S	4 %	Nov. 1
Ill. Nor. Util., pf.....	Q	1.5 %	Nov. 1
Kan. Gas. & Elec., pf...	Q	1.5 %	Oct. 1
Manchester Trac., Pr. & Lt.	Q	2 %	Oct. 15
Montreal Teleg.....	Q	2 %	Oct. 15
Montreal Teleg., extra..	—	1 %	Oct. 15
Mountain States Tel. & Tel.	Q	1.75%	Oct. 15
Northern States Pr....	Q	1.75%	Oct. 15
Ottawa Ry. & Lt., pf...	Q	1.75%	Oct. 15
Penn. Cent. Lt. & Pr., pf.	Q	1 %	Oct. 4
Penn. Ltg. Co., pf.....	Q	1.25%	Oct. 15
Pub. Serv. Co. of Nor. Ill.	Q	1.5 %	Nov. 1
Pub. Serv. Co. of Nor. Ill., pf.....	Q	1.5 %	Nov. 1
United Rys. & Elec. Baltimore, com.....	Q	50c	Oct. 15
Va. Ry. & Pr.....	Q	1.5 %	Oct. 20
Wash., Baltl. & Annap. Elec., pf.....	Q	1.5 %	Sept. 30

Reports of Earnings.

WISCONSIN EDISON COMPANY
(North American Company, Subsidiary.)

	1915
August gross.....	$ 794 873
Expenses and taxes.....	416,538
Net earnings.....	258,335
Balance available for Wisconsin Edison and depreciation.....	121,002
Twelve months gross.....	8,459,850
Expenses and taxes.....	6,036,487
Net earnings.....	3,416,363
Balance available for Wisconsin Edison and depreciation.....	1,781,426

The appropriation for depreciation of subsidiary companies for the 12 months ended August 31, 1915, was $874,776, an increase of 6.95 per cent over the similar appropriation for the preceding year.

ELMIRA WATER, LIGHT & RAILROAD.

Three months and the 12 months ended June 30, 1915:

	1915	1914
Three months gross....$	256,652	$ 270,890
Net after taxes.....	95,171	102,170
Surplus after charges..	43,030	33,916
Twelve months gross..	1,105,889	1,067,355
Net after taxes.....	453,700	379,777
Surplus after charges..	214,270	127,130

Decrease in earnings and reduction in fixed charges for the three months is due to the sale by the company to the City of Elmira, in April, 1915, of the water works department, the proceeds of the sale being used to retire bonds of the company, thus increasing the surplus.

WESTERN RAILWAYS & LIGHT.

Three months and twelve months ended June 30:

	1915	1914
Three months gross....$	623,786	$ 647,021
Net after taxes.....	216 027	245,609
Surplus after charges..	48,173	62,477
Balance after preferred dividends	638	14,942
Twelve months gross..	2,691,937	2,654,178
Net after taxes.....	1,075,727	1,051,650
Surplus after charges..	375,426	377,389
Balance after preferred dividends	185,286	187,249

NEW ENGLAND TELEPHONE & TELEGRAPH.

New England Telephone & Telegraph Company reports to the Public Service Commission for the year ended June 30, 1915, compared as follows:

	1915	1914
Gross .....$	17 973,606	$17,798,327
Net	5 048,199	4,380,350
Surplus after charges	3 321,410	3,137,333
Dividends	3,025 732	3,017,896
Surplus	295,678	119,437

TWIN CITY LINES.

	1915	1914
August gross.....$	797 662	$ 796,205
Net	300 975	302,637
Surplus after charges..	183,464	171,498
Eight months gross....	6 180,302	6,123 344
Net	2,151 489	2 988 536
Surplus after charges..	1,090,758	1,248,437

NORTHERN STATES POWER.

	1915	1914
August gross.....$	377 349	$ 389 579
Net after taxes.....	197,738	172,723
Eight months gross...	3 204,903	2,855 892
Net after taxes.....	1,748 948	1,493,969
Twelve months gross..	4 868 772	.....
Net after taxes.....	2,804 728	.....
Surplus after charges..	1,197,543	.....
Balance after preferred dividends	610,474	.....

CITIES SERVICE COMPANIES.

	1915	1914
August gross .....$	312 795	$ 264 881
Net after expenses.....	208,170	252,581
Surplus after charges....	257,336	211,747
Balance after preferred dividends	128,503	74,914
12 months' gross	4 051,573	3,671,480
Net after expenses.....	3 805,732	3 571,465
Surplus after charges ...	3,405,732	3,225,023
Balance after preferred dividends	1,817,736	1,729,604

Accumulated surplus August 31, 1915, $4,648,369.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Oct. 4.	Sept. 27.
American Tel. & Tel. (New York)	123¾	125⅛
Commonwealth Edison (Chicago)	136½	136
Edison Electric Illuminating (Boston)	240	239½
Electric Storage Battery common (Philadelphia)	74	74
Electric Storage Battery preferred (Philadelphia)	74	74
General Electric (New York)	177½	173½
Kings County Electric (New York)	120	120
Massachusetts Electric common (Boston)	8¾	9
Massachusetts Electric preferred (Boston)	42	43
National Carbon common (Chicago)	158	140½
National Carbon preferred (Chicago)	120	121
New England Telephone (Boston)	132	131
Philadelphia Electric (Philadelphia)	25	25
Postal Telegraph and Cables common (New York)	78	76¼
Postal Telegraph and Cables preferred (New York)	65¼	66½
Western Union (New York)	76⅞	77
Westinghouse common (New York)	137¾	121⅛
Westinghouse preferred (New York)	146	140

PERSONAL MENTION.

MR. E. B. GRAY, well known in Canada and in the Middle West, has accepted a position with the Detroit Fuse & Manufacturing Company, with headquarters at Chicago. Mr. Gray was formerly with the Holophane Works of the General Electric Company at Chicago and more recently has been representing this company in Toronto, Can.

MR. BYRON T. BURT, vice-president of the Rutland Railway, Light and Power Company, Rutland, Vt., has assumed the duties of general manager of that company in addition to the vice-presidency. Mr. Burt was formerly general manager of the Chattanooga and Tennessee River Power Company, with headquarters at Chattanooga, Tenn.

MR. JOHN C. M'CLENDON, who has been connected with the Harry I. Wood Company, was guest of honor at a dinner given by Jovian friends at the Henry Watterson Hotel, Louisville, before going to Elyria, O., where he will be connected with the R. E. Burger Electric Light and Power Company. Farewell addresses were made by a number of the members of the order and a traveling case was presented as a farewell gift.

MR. WALTER E. HOLLAND has resigned his position as research engineer of the Anderson Electric Car Company, Detroit, to become a firm member of the Broadway Automobile Company, Inc., of Seattle, Wash., agents in the Northwest for Detroit electric pleasure cars, Walker electric trucks, Elwell-Parker industrial trucks and Philadelphia storage batteries. Mr. Holland will be secretary and treasurer of the Broadway Automobile Company. Mr. Holland was for ten years connected with the Thomas A. Edison interests at Orange, N. J., and is well known as an expert on storage batteries and electric vehicles.

MR. T. LEE MILLER has been placed in charge of the Sangamo Electric Company's New York office, 50 Church Street. He was graduated from the University of Cornell, class of 1909, with the degree of mechanical engineer, and established connections with Marwick, Mitchell, Peat & Company, accountants, where he originated and established the present efficiency system for the Buick Motor Company. For the past four and a half years he was associated with the Toledo Railways and Light Company in the capacity of assistant to the president in charge of purchases and car maintenance. Mr. Miller is an associate member of American Institute of Electrical Engineers and of the American Society of Mechanical Engineers. He is a member of the National Electric Light Association, Racquet and Tennis Club Cornell University Club, and West Side Tennis Club of New York.

MR. J. H. PRIOR has been appointed chief engineer of the Illinois Public Utilities Commission, with headquarters at Springfield, Ill. Mr. Prior has been in the service of the Illinois Public Utilities Commission for about one year, as assistant chief engineer. He was educated at the Armour Institute of Technology and the University of Chicago. He was formerly assistant engineer in the service of Ralph Modieska, civil engineer, and he was engineer of design of the Chicago, Milwaukee & St. Paul Railway from

1905 to 1914, in charge of the design of the heavy track elevation work executed by that company in the cities of Chicago, Ill.; Evanston, Ill.; Milwaukee, Wis.; and Minneapolis, Minn., during those years. He made some of the first valuations of railroad structures required by state regulatory and taxing bodies. He is a member of the American Railway Engineering Association, the American Economic Association, and the Chicago Engineers' Club. The Illinois Commission, which Mr. Prior will serve, has the broadest jurisdiction and powers. It is charged with the regulation, not only of steam and electric railways, gas and electric plants, but with the supervision of telephone companies, heating plants, warehouses, water works, wharfingers and steamboat lines, except such utilities as are municipally owned. The organization of the engineering department of the Commission has been proceeding during the past year until the Commission has a staff of nearly 30 engineers engaged in appraisal work, in service inspection, safety-appliance inspection and grade-separation work. Mr. Prior has been discharging the duties of chief engineer for the past seven months, pending his appointment.

J. H. Prior.

E. C. Robinson.

MR. E. C. ROBINSON, who was recently elected president of the Northwest Electric Light and Power Association, was born in Memphis, Tenn., September 12, 1875. He prepared for college at the Memphis Military Institute, later entering the University of Tennessee. On account of ill health in the summer of 1894 he went to Leland Stanford University, Palo Alto, Cal., that fall completing the course of electrical engineering, and receiving the degree of Bachelor of Science. Mr. Robinson followed electrical construction in Los Angeles for about a year. He then went to the Klondyke, Y. T., and spent four years in various electrical and steam engineering work, installing many isolated plants and serving as chief electrician for the Dawson Light & Power Company. He left Dawson in the fall of 1902, settling in Seattle, and accepting the position of superintendent of the Ballard Electric Company. This was a defunct municipal plant taken over by a private company, and Mr. Robinson had to re-build and put on a financial footing this run-down municipal experiment. He resigned this position for superintendent and manager of the Skagit Improvement Company of Sedro-Woolley, serving here about one and a half years, when he accepted the position he now holds as manager and engineer for the Jim Creek Water, Light & Power Company, at Arlington, Wash. He still serves as consulting engineer for the Skagit Improvement Company. Mr. Robinson has built the present hydroelectric plant, and has made an excellent showing for a system of that size. He was a charter member of the Seattle Section of the American Institute of Electrical Engineers, and has been an active figure in the Northwest Association from its inception, having served on various committees and also for two years as vice-president of the Association for Washington.

OBITUARY.

MR. ISAAC B. HAMMOND, Portland, Ore., for more than 25 years owner of the Hammond Manufacturing and Electric Company, died on September 22, at his home in Portland. Mr. Hammond was 71 years of age. The deceased was born at Lambs Corner, New York, on May 24, 1844, and came west in early life. For many years he had been very active in civic affairs of Portland, was a prominent Mason and belonged to the leading clubs of Portland. Death was caused by hardening of the arteries and complication of diseases.

DATES AHEAD.

Jovian Order. Thirteenth annual convention, Hotel Sherman, Chicago, Ill., October 13-15. Mercury, Ell. C. Bennett, Syndicate Trust Building, St. Louis, Mo.

Electric Vehicle Association of America. Annual convention, Cleveland, O., October 18-19. Executive secretary, A. J. Marshall, 29 West Thirty-ninth Street, New York, N. Y.

Association of Railway Electrical Engineers. Annual convention, Hotel LaSalle, Chicago, Ill., October 18-22. Secretary, J. A. Andreucetti, Chicago & Northwestern Railway Company, Chicago, Ill.

Kansas Gas, Water, Electric Light and Street Railway Association. Annual convention, Topeka, Kans., October 21. Secretary, Ivor Thomas, 237 South Main Street, Wichita, Kans.

Mississippi Electric Association. Annual convention, Hattiesburg, Miss., November 10-11. Secretary, H. F. Wheeler, Hattiesburg, Miss.

With the Electrical Manufacturers

Westinghouse Lamp Company has moved its Philadelphia office from the North American Building, to more spacious quarters in the Widener Building.

Lux Manufacturing Company, Hoboken, N. J., has issued a new price list of Lux tungsten vacuum lamps, gas-filled tungsten lamps and concentrated-filament tungsten lamps. All lamps made by this company are manufactured in this country.

Crouse-Hinds Company, Syracuse, N. Y., has issued a set of lists of conduit stock for the benefit of contractors, dealers and central stations. Seven typical lists giving assorted conduit fittings are given, also very favorable discount arrangements attainable thereby.

The Fibre Conduit Company, Orangeburg, N. Y., has moved its New York office to 101 Park Avenue, at the corner of Fortieth Street, New York City. This change was necessitated by the growth of the business requiring larger quarters. The new office is about three times the size of the former New York office.

Central Electric Company, 326 South Fifth Avenue, Chicago, Ill., has issued Bulletin No. 45 illustrating and describing the Ralco line of heavy-current plugs and receptacles. These are meeting with much favor in shops, roundhouses, docks, schools, etc., where large portable tools, machines, lamps, etc., are to be connected to circuits. The company also has ready

for distribution a folder giving illustrations and data on a new line of Maxolite fixtures for gas-filled Mazda lamps.

National Carbon Company, Cleveland, O., has issued a new booklet on Columbia batteries. It gives not only illustrations and valuable data on the various types of the well known Columbia dry cells, but also similar data on the several types of wet cells made by the company, among which are the National, Trojan, Le Clanche, Fuller and Columbia; the latter is a caustic-soda closed-circuit battery. Connectors and testing instruments are also included. The booklet also contains a brief history of the company and views of its eleven factories in the United States and Canada.

Bolinders Company, 30 Church Street, New York City, has issued a bulletin illustrating and briefly describing the Bolinder stationary engines for using heavy crude oil as fuel. This type of engine was originated by the parent Bolinders Company, of Stockholm, Sweden, which has put in service in all parts of the world, over 11,000 engines aggregating about 350,000 brake horsepower. The American company has but recently begun the introduction of this type of engine in this country and feels confident that the excellent results achieved with it abroad will assure it a demand here where simplicity and compactness of design and economy in operation are appreciated.

The Adanti Manufacturing Company, 919 West Avenue, Cleveland, O., has ready for distribution a new catalog of Adaptibox conduit fittings and other labor-saving electrical specialties. This catalog has been prepared with the idea of convenience to the electrical contractors and others interested in these devices. All illustrations are printed on the outer margin of the page directly opposite the listing of the article illustrated. Each specialty is clearly described and specified and a number of footnotes are repeated at the bottom of the page to save the trouble of looking up references usually put at the back of such lists. In addition to the complete line of Adaptibox fittings there are shown a number of special appliances including switchboxes, reinforced-concrete outlet boxes, loom clamps and connectors, and a new combination outlet box and receptacle. A copy of this catalog will be sent to anyone on request to the company.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., reports the following among orders recently received: Public Service Electric Company, Perth Amboy, N. J., two 1,083 kilovolt-ampere, 60-cycle, 13,200-volt three-phase to 2,600-volt two-phase duplex air-blast transformers. Board of Comissioners State Institutions, Lincoln, Neb., one 200-kilowatt, 240-volt, three-phase, 60-cycle, engine-type generator; one 15-kilowatt, turbine gear-driven exciter; one 20-kilowatt, motor-driven exciter; 190-kilovolt-amperes in 12 transformers of various sizes; 103.5 horsepower in 12 220-volt, three-phase motors. J. G. Robertson, Warren, Minn., one 150-kilovolt-ampere and one 75-kilovolt-ampere, 2,400-volt, three-phase, 60-cycle, engine-type generators; two belted exciters; one four-panel switchboard. Interurban Construction Company, for Salt Lake & Utah Railroad, three 250-kilowatt, 750-volt rotary converters for operation two in series on 1,500-volt direct-current circuit, alternating-current self-starting; three 150-kilovolt-ampere, 44,000-volt transformers with triple secondaries and complete switching equipment for same. Craig Electric Company, for Schenley High School, Pittsburgh, Pa., two 300-kilowatt, 250-volt direct-current, self-starting rotary converters, and one 10-panel switchboard. Public Service Electric Company, Newark, N. J., one 1,083-kilovolt-ampere, 11,000-volt, three-phase to 2,600-volt, two-phase, air-blast duplex transformer; four 48-kilovolt-ampere, two 24-kilovolt-ampere, single-phase, 60-cycle, 2,400-volt, 10 per cent regulation induction regulators. New York & Queens Electric Light & Power Company, Long Island City, N. Y., two 1,500-kilovolt-ampere, single-phase, 60-cycle, 13,000 to 2,200-volt air-blast transformers; two 1,000-kilovolt-ampere, single-phase, 60-cycle, 15,000 to 2,200-volt, air-blast transformers; three 1,500-kilovolt-ampere, single-phase, 60-cycle, 14,000 to 8,400-volt, air-blast transformers, complete with dial regulator of the step type, and four 46-kilovolt-ampere, single-phase, 60-cycle, 2,300-volt, 10 per-cent-regulation induction regulators. Burlington Traction Company, Burlington, Vt., one 500-kilowatt, 600-volt, direct-current, six-phase, 60-cycle, alternating-current, self-starting rotary converter; three 165-kilovolt-ampere, 2,400-volt to rotary-converter voltage, single-phase transformers; one two-panel switchboard.

Record ef Electrical Patents

Issued by the United States Patent Office, September 28, 1915.

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,154,600. Damper-Controlling Apparatus. D. Belden, assignor to Jewell Mfg. Co., Auburn, N. Y. Details of thermostatic control of operating motor.

1,154,601. Extraction, Purification and Electrolytic Precipitation of Metallic Zinc from Smelter Fumes, Zinc Ores and the Like. O. Best, San Francisco, Cal. Pure zinc sulphate suitable for electrolyte is formed and zinc and sulphuric acid formed therefrom by electrolyzing, the acid being then neutralized and the neutral solution returned to the cell.

1,154,604. Electroplating Device. H. R. Boissier, Great Neck, N. Y. Particular structure of revoluble cathode carrying rack.

1,154,615. Safety Lamp. H. Csanyi, assignor to Maxivolt Primary Battery Co., New York, N. Y. Lamp in lensed casing has circuit held closed by frangible, translucent member bearing on bulb.

1,154,625. Terminal for Electric Apparatus. W. S. Hadaway, Jr., New Rochelle, N. Y. Resistor ribbon for heater has reinforced end.

1,154,628. Wireless Selective System and Apparatus. J. H. Hammond, Jr., Gloucester, Mass. Particular arrangement of receiving and relay stations.

1,154 653. Steering and Controlling System for Automobiles. A. W. Pattison, assignor to Grinnell Electric Car Co., Detroit, Mich. Controller shiftable so as to permit operating from front or rear seat.

1,154,660. Plating Machine. L. Schulte, assignor to Electro Chemical Products Association, Chicago, Ill. Arrangement of tanks and structure of tube carrier.

1,154,671. Generator Mounting and Drive for Railway Cars. W. I. Thompson, assignor to Safety Car Heating Co., New York, N. Y. For axle-driven, car-lighting generator.

1,154,764. Insulating Head. C. L. Van Ness, Akron, O. Structure and arrangement of wire die and wire guider.

1,154,700. Telephone Apparatus. A. J. Kempien, St. Paul, Minn. Hand-controlled dimming resistance in branch at subscriber's station controls lamp associated with cord and line circuits at central.

1,154,701. Process of Producing Tungsten Filaments. E. A. Krüger, Seehausen, Altmark, Germany. Rod consisting of powdered tungsten with small proportion of boric acid and carbon, is caked together by heating and then made incandescent by electric current in stream of hydrogen and reduced to wire.

1,154,725. Regulator. G. R. Radley, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Automatic controller requiring two ranges of control to operate in proper succession.

1,154,728. Rheostat. T. Rhodus, Chicago, Ill. Has particular form of resistance ring and rotating interior contactor.

1,154,733. Circuit-Controller. A. Simon, assignor to Cutler-Hammer Mfg. Co. For polyphase circuits.

1,154,735. Photographic Printing Apparatus. S. A. Smith, Burlington, Vt. Automatic apparatus has white and red lamps for illuminating at printing and other times.

1,154,738. Insulated Rail-Joint. C. E. Stevens, Lenexa, Kans. Arrangement of chairs, fish plates, insulation, etc.

1,154,750. Amplifying Electrical Impulses. R. A. Fessenden, Brant Rock, Mass. Amplifying circuit carries alternating current and is attuned to frequency of prime circuit, the circuits being inductively associated by means including a split circuit having reversely arranged rectifiers in its branches.

1,154,759. Trolley-Pole Base. C. E. Gierding, assignor to Ohio Brass Co., Mansfield, O. Detachable connection of pole to fork.

1,154,773. Junction Box. S. A. Huntington, Syracuse, N. Y. Special arrangement of insulating plates, busbars, etc., in water-tight, cable-connecting box.

1,154,785. Controlling Mechanism for Internal-Combustion Engines. H. Lemp, assignor to General Electric Co., Schenectady, N. Y. Electromagnetic regulators for pilot and additional engines.

1,154,791. Mechanical Releasing Means for Electric Brakes. G. M. Marr, New York, N. Y. Spring-applied, magnet-retracted brake has cam device for decreasing pressure on spring on release.

1,154,808. Method of Joining Metal by Welded Rivets. A. F. Rietzel, assignor to Universal Electric Welding Co., New York, N. Y. Elements of composite metal work united by a welding piece located between them and electrically welded in holes in their meeting portions.

1,154,818. Electric-Light Hanger and Adjuster for Mastarms. R. W. VanDorn, Saratoga Springs, N. Y. Rope and pulley arrangement.

1,154,820. Light-Regulating Device for Film-Printing Machines. G. White, Jersey City, N. J. Resistance device having its sections arranged in different combinations by exchangeable cards of insulating material carrying conducting eyelets.

1,154,823. Pot-Head Connector. P. F. Williams, assignor to G. & W. Electric Specialty Co., Chicago, Ill. Connection is made by rotating intermediate member of the connector.

1,154,824. Headlight. R. F. Wilson, Denver, Colo. Concave reflector has lower half absorbent and upper half reflective.

1,154,828. Sleet-Cutter for Trolley Wires. W. H. Ahrens, Canandaigua, N. Y. Mounting of cutter on bracket for attachment to trolley harp.

1,154,834. Attaching Plug. H. P. Ball, assignor to General Electric Co. Two-part socket in insulating casing held together by spring on outside of casing acting through opening.

1,154,849. Means for Controlling Electric Current. C. R. England, assignor of one-half to R. E. Stone, McKeesport, Pa. Particular arrangement of adjustable resistance cartridge containing granular resistance material, and short-circuiting switch.

1,154,852. System of Current Distribution. C. Le G. Fortescue, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Arrangements of trans-

former and rectifiers for constant-current arc circuit.

1,154,856. Potential Transformer. O. W. Lunnon and E. Harvey, Denver, Colo. Special arrangement of core and coils.

1,154,903. Bonding Device for Rails. A. A. Ziegler, boston, Mass. Tie bolts for fish plates support the bonding wires.

1,154,907. Electrostatic Separator for Sorting Out the Constituent Parts of Commodities According to Their Premeability. A. Bibolini, Agordo, and P. Riboni, Naples, Italy. Arrangements of field plate, conveyor and drums.

1,154,916. Cable Clamp. I. Evans, Lenoir City, Tenn. Has peculiar wedging means for gripping the cable.

1,154,923. Time-Controlled Thermostat. C. E. Jewell, assignor to Honeywell Heating Specialty Co., Wabash, Ind. Has provision for manual adjustment.

1,154,929. Signaling System. O. M. Leich and C. E. Hague, assignors to Kellogg Switchboard & Supply Co., Chicago, Ill. Automatic exchange system for party-line telephones.

1,154,933. Electrically Welded Tubing and Process of Making the Same. K. Peiseler, assignor to Thomson Electric Welding Co., Lynn, Mass. Joint of butt-welded tubes expanded so that inside burr will not restrict diameter beyond that of tube sections.

1,154,934. Sphygmomanometer. C. J. Pilling and G. S. White, assignors to G. P. Pilling & Son Co., Philadelphia, Pa. Pressure-controlled mercury column successively closes circuits containing translating devices having distinguishing characteristics.

1,154,945. Automatic Electric Regulator. E. B. H. Tower, Jr., assignor to United States Light & Heating Co., Niagara Falls, N. Y. Provision for increasing sensitiveness of electromagnetically operated carbon-disk rhetostat in regulator for carlighting system.

1,154,952. Electrical Heating Device. E. L. Wiegand, Youngstown, O. Resistor is imbedded in enamel in heating plate.

1,154,954. Electric Range. R. Williams, assignor to Simplex Electric Heating Co., Camoridge, Mass. Some heaters of range are turned out as others are turned on so as to keep maximum demand within total current capacity.

1,154,956. Electric Train-Control System. E. Woltmann, New York, N. Y., assignor to Automatic Train Stop Co. Train-controlled, sectional power-conductor system prevents too-near approach of trains.

1,154,963. Separable Attachment-Plug. R. B. Benjamin, assignor to Benjamin Electric Mfg. Co., Chicago, Ill. Details.

1,154,964. Braider Mechanism. F. Bentley, assignor to Simplex Wire & Cable Co., Cambridge, Mass. For use in covering w[illegible] roof wire.

1,154,976. Controller for Electric Motors. H. H. Cutler, Milwaukee, Wis. Electromagnetically operated resistance device for automatically accelerating motors.

1,154,979. Electrical Measuring Instrument. A. L. R. Ellis, assignor to General Electric Co. Arrangement of counterbalance for indicator arm of moving-coil instrument.

1,154,983. Machine-Efficiency Recorder. H. R. Ford, Buffalo, N. Y. Electromagnetically operated; forms record showing periods of rest and operation also output.

1,154,992. Apparatus for Electrically Igniting Miners' Safety Lamps. V. E. Joyce, London, England. Casing contains lamp and generator and generator is inoperative except when casing is closed.

1,154,993. A. J. Kercher, assignor to Berkeley Electric Cooker Co., Berkeley, Cal. Relates to heat insulation of electric cooker.

1,155,001. Apparatus for Regulating the Field Density of Electric Generators. G. S. Neeley, assignor to General Electric Co. Vibratory-contact voltage regulator.

1,155,021. Electric-Meter Brush. R. S. White, Washington, D. C. Moves with commutator in end play of armature.

1,155,026. Signaling Device for Vehicles. W. D. C. Wright, Philadelphia, Pa. Electromagnetically operated direction-indicator for automobiles.

1,155,036. Electrotherapeutic Apparatus. S. Brooks, Jr., and C. R. Anderson, Los Angeles, Cal. Arrangement of applicators and circuits in combined continuous-current and intermittent-current device.

1,155,046 and 1,155,047. Storage Battery. W. A. Crowdus, assignor to Atkinson, Mentzer & Co., Chicago, Ill. First patent: structure of grid holding active material. Second patent: plate spacing and groundwood-pulp filler for absorbing electrolyte.

1,155,058. Electrical Resistance. C. E. Hay, Ilford, and H. W. Sullivan, London, England. Arrangement of superposed cylindrical windings to neutralize inductance. (See cut.)

1,155,063. Pigtail Brush. J. Hetherington, Newark, N. J., and C. E. Chapin, New York, N. Y.; said Hetherington assignor to said Chapin. Connection of conductor to carbon brush.

1,155,095. Electrical Measuring Instrument. W. E. Porter, assignor to General Electric Co. Arrangement of counterbalancing and counterweight arms on movable element.

1,155,098. Electrically Operated Water Heater for Automobile Radiators. E. M. Rosenbluth, Philadelphia, Pa. Attachment having circulation through intake and drip cock.

1,155,103. Portable Electric Flashlight. C. J. Sagebrecht, assignor to Interstate Electric Novelty Co., New York, N. Y. Structure of tubular casing and arrangement of conductors.

1,155,106. Synchronizing Recorder. E. O. Schweitzer, Chicago, Ill. Movements of pointer recorded on movable sheet with provision for controlling the recording and advance of sheet.

1,155,121. Switch. V. G. Apple, Dayton, O. Details of push snap switch.

1,155,123. Driving Mechanism. F. C. Barton, assignor to General Electric Co. Motor in hub drives rim of tractor wheel through gearing.

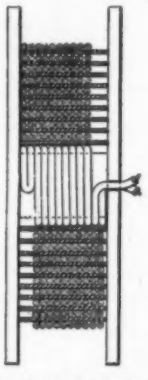
1,155,127. Cable Support. O. W. Brenizer, assignor of one-half to D. L. Short, West Collingswood, N. J. Single piece of wire for suspending from messenger.

1,155,133. Protective Means for Electrical Systems. F. Conrad, assignor to Westinghouse Electric & Mfg. Co. Arrangement of circuit-breakers and tripping coils at ends of transmission line for cutting it out upon abnormal conditions.

1,155,134. Means for Protecting Electrical Systems. F. Conrad, assignor to Westinghouse Electric & Mfg. Co. Modification of above for same purpose.

1,155,144. Burglar-Alarm. H. T. Gay, assignor to Protection Co., Baltimore, Md. Battery bell circuit in box is closed when box is moved.

1,155,157. Reversing Switch. H. A. Lewis, assignor to Westinghouse Electric & Mfg. Co. Details of magnet-operated device.



No. 1,155,058.—Noninductive Resistance.

1,155,162. Frame for Turbo-Driven Machines. R. H. Rice, assignor to General Electric Co. Girder frame for turbo-generator.

1,155,163. Geared Turbine-Driven Set. R. H. Rice, assignor to General Electric Co. Relates to gearing between turbine and dynamo in unitary set.

1,155,164. System and Method of Control for Electric Motors. L. G. Riley, assignor to Westinghouse Electric & Mfg. Co. Battery sections and motor windings are connected in different series-parallel combinations.

1,155,166. Percolator. E. E. Rose, assignor to Westinghouse Electric & Mfg. Co. Arrangement of electric heater at base of fountain tube.

1,155,167. Electric Heating Apparatus. E. E. Rose, assignor to Westinghouse Electric & Mfg. Co. Heating unit has resistor in casing with one end exposed.

1,155,170. System and Method of Control for Electric Motors. N. W. Storer, assignor to Westinghouse Electric & Mfg. Co. Electric motor operated regeneratively in battery vehicle.

1,155,172. Vending Machine. H. J. Sweany, Quapaw, Okla. Electrically operated ticket-seller.

1,155,197. System of Electric Motor Control. H. L. Beach, assignor to Westinghouse Electric & Mfg. Co. Speed control of motor for planers, etc.

1,155,208. Electrically Lighted Pencil. W. Q. Browne, Boston, Mass. Pencil-holding attachment at end of flashlight casing.

1,155,225. Electric Locomotive. G. M. Eaton, assignor to Westinghouse Electric & Mfg. Co. Arrangement of cab, trucks, etc

1,155,226. Trolley Wheel. E. E. Eby, assignor to Westinghouse Electric & Mfg. Co. Connection to wheel made by disk on shaft dipping into conducting liquid in recess in wheel.

1,155,249. Flashlight. H. M. Koretzky, New York, N. Y. Details of battery lamp arranged in casing resembling a watch.

1,155,290 and 1,155,291. Starting Box. M. Talgman, New York, N. Y. First patent: for ceiling attachment; arrangement of retracting spring. Second patent, same type; arrangement of operating levers.

1,155,294. Signaling Device. L. Abeles, assignor of one-half to D. J. Shern, Philadelphia, Pa. Automobile tail indicator having apparatus arranged to be removable as unit from casing.

1,155,300. Expression Device for Electric Organs. J. W. Darley, Jr., Baltimore, Md. Vibratory bodies electrically controlled by key, the degree of control depending upon the speed impressed on the key.

1,155,301. Key-Controlled Contact-Maker for Use With Musical Instruments. J. W. Darley, Jr. Related to above.

1,155,302 Circuit-Closer. J. W. Darley, Jr., Baltimore, Md. Related to above; contacts made depend upon extent of movement of key and pedal-controlled means.

1,155,307. Switch-Operating Device. D. D. Gordon, assignor to Yost Electric Mfg. Co., Toledo, O. Details of pull socket.

1,155,317. Method of Applying Protective Coatings to Metallic Articles. Clarence Mark and Clayton Mark, Jr., assignors to Clayton Mark, Lake Forest, Ill. Article is immersed in molten lead bath protected by flux of sal-ammoniac containing iron and zinc salts, the lead bath being alloyed with sufficient zinc to render the coating obtained electronositive to iron.

1,155,322. Electric-Circuit-Timing Device. R. C. Leake, assignor, to General Railway Signal Co., Gates, N. Y. Contacting of finger timed by rocking part to which it is secured.

Reissue 13,909. Selective System of Telephony. R. C. M. Hastings assignor to International Telephone Co., Columbus, O. Original No. 1,061,285, dated May 13, 1913. Particular arrangement for selectively calling and locking out subscribers on party lines.

Patents Expired.

The following United States electrical patents expired on October 4, 1915:

611,601. Electric Arc Lamp. S. Bergmann, New York, N. Y.

611,638. Signal Apparatus. H. G. Leopold, New York, N. Y.

611,707. Electrical Connector. J. Pedriali, Brussels, Belgium.

611,719. Electrical Circuit-Controller. N. Tesla, New York, N. Y.

611,722. Electrical Measuring Instrument. E. Weston, Newark, N. J.

611,723. Index Needle or Hand for Electrical Measuring Instruments. E. Weston.

611,724. Electrometer. E. Weston.

611,752. Trolley Ear. H. Geisenhöner, Schenectady, N. Y.

611,760. Surface-Contact Railway System. W. B. Potter, Schenectady, N. Y.

611,766. Device for Suspending Arc Lamps. J. Borka, Buffalo, N. Y.

611,778. Electric Railway. J. B. Ents, Philadelphia, Pa.

611,809. Electric Meter. S. Evershed, London, England.

611,820. Roadbed Construction. J. H. Robertson, New York, N. Y.

611,821. Electric Railway Conduit and Trolley. J. H. Robertson, New York, N. Y.

611,822. Electric Time Switch. F. M. Schmidt, J. H. Gerry and W. S. Barstow, New York, N. Y.

611,850. Electromagnetic Engine. P. B. Watson, Philadelphia, Pa.

611,869. Automatic Switch Apparatus. A. Schlatter, Budapest, Austria-Hungary.

611,894. Signaling. J. P. Coleman, Edgewood Park, Pa.

611,897. Electric Signal Device for Railways. L. T. Dube, Paris, France.

611,902. Apparatus for Adjusting Phases of Alternating Currents. J. H. F. Görges, Berlin, Germany.

611,919. Telegraph Key. F. E. Lewis, Jefferson, Tex.

611,927. Multiple-Rate Metering System. F. T. McIntyre, Washington, D. C.

611,943. Railway Signaling. J. G. Schreuder, Edgewood Park, Pa.

611,970. Method of and Means for Controlling Energy Delivered to Translating Devices. H. W. Leonard, East Orange, N. J.

611,971. Electrical Wireman's Combined Gauge and Calculator. H. Lutz, Hamilton, Can.

611,974. Automatic Switching and Telephone System. L. G. Nilson, Sioux City, Iowa.